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MACHINE GUNS AND THE SUPPLY OF SMALL-ARM
AMMUNITION ON THE BATTLE-FIELD.

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MAJOR THIRD ARTILLERY.

THE subject of the status of machine guns has received the attention of many eminent authorities, and in a literary way has been more or less exhausted.

It is not intended to discuss the entire subject in this article, but after what is considered a necessary presentation of it, to invite attention to what applies to our Service, and its necessities.

The special uses to which these guns can be put with advantage, have been ably discussed by various writers at length, but their real status can alone be determined by actual experience gained in battle. Having had no such experience in this country we are forced to seek for information on the subject among the nations of Europe.

There can be no question that these guns will prove an all-important factor in deciding war, and the nation which best employs them, and fully understands their working and organization, will surely come off the victor. The machine guns now in use are accurate, rapid in their fire, and terrible in their power for disabling men.

They economize life, inasmuch as by their use manual labor is superseded by automatic action. They are labor and life-saving machines enabling a few men to do the work of a greater number, and better at times. The machine gun is a special

weapon, not the rival of nor intended to compete with field artillery. It is a special weapon, invaluable for certain purposes, and the natural result of the great advance made during late years, in all branches of the science of war.

History repeatedly shows that wars have been won because one of the combatants possessed superior arms, other things being equal.

The French used their mitrailleuses with more or less success during the war of 1870-1, and English history of the past few years abounds with instances proving the value of these guns in field service, more especially of late.

Lord Wolseley states as his opinion, that the Soudan campaign has established without doubt the importance of having machine guns in the field. He thinks also that the gun has an immense future in prospect, and that it will revolutionize tactics.

The English government has recently adopted machine guns for the field, and ordered the construction of a large number for this service. The other nations of Europe are fully alive to the value of these guns, and are purchasing them in large numbers.

The opinions of those best qualified to judge, particularly when they show that they are not affected by narrow-minded prejudice, are that automatic guns have a place on the battlefield. With the great improvements that have been made within the last few years, not only in the guns themselves but in small-arm ammunition, much more can reasonably be expected now than from the mitrailleuse used by the French.

This gun used paper-cased cartridges which were imperfectly made, and the gun itself was imperfect, not to be compared with the machine guns of the present time; nevertheless, it produced important results.

During the battle of Mars-la-tour the 38th Prussian Infantry Brigade supported by the 2d Heavy Battery advanced against Grenier's Division. The official report states that these troops encountered a murderous infantry and machine-gun fire, and were obliged to fall back, their losses "*amounting almost to annihilation*"; that cavalry attempted to protect the shattered remnant of the brigade, "but that on account of the violent mitrailleuse fire the leader was unable to deliver home his attack."

The 38th Brigade (5 battalions) went into action with 95 officers, and 4,546 men, and sustained a loss of 72 officers, and 2,542 men killed, wounded, and prisoners.

The proportion between killed and wounded being as 3 to 4.

At Sedan five or six mitrailleuses played with deadly effect on the Prussians at a range of about 900 yards, and their effect was confessedly superior to any which could have been inflicted by common shell.

In fact, on the few occasions in which machine guns have come into action—under conditions when their value could be tested—the results have been simply devastating.

How many men of Pickett's command would have rejoined General Lee's lines at Gettysburg if we could have concentrated thirty-six or forty-eight machine guns well commanded and served, after the artillery fire had ceased, to receive their charge? In this country the status of the gun has never been determined, and, as with other nations, the question has remained to be decided in the future. As a distinguished officer * has stated: "The artillery like it and do not like it. They think they must take it, and yet they do not like to take it. The cavalry have nibbled at it, but I think most of us are of opinion that it is hardly a cavalry weapon. The infantry, I do not think, very much care about it, as the great feature of infantry is mobility."

High military authorities in our army, including Generals Sherman, McClellan, and Hunt, have assigned it to the artillery, It is classed as artillery by the Ordnance Department, and recognized as such by the authorized artillery tactics, although the artillery have had but little to do with it in field service.

Notwithstanding that the gun is a "cluster of rifles," it comes nearer being an artillery weapon than one belonging to the other two arms of the Service.

Its equipment, necessitating horses and harness, naturally relegates it to the artillery.

Machine guns, however, should not be used as strictly an infantry, cavalry, or artillery weapon, but as a class apart, to assist all and interfere with neither.

The best and most efficient organization for machine guns is that of a battery of artillery. Better care will be taken of the guns and horses, better instruction given to the men, a better discipline maintained, a higher degree of mobility secured, and increased *esprit-de-corps* engendered.

As to the wisdom and necessity for the field use of machine-gun batteries with our troops, Major-General Henry J. Hunt,

* Colonel Lonsdale Hale, R. E.

U. S. A., formerly Chief of Artillery, Army of the Potomac, reported officially, in 1878, as follows :

"The introduction of the Gatling gun—an artillery weapon—gave the first opportunity to employ batteries legitimately in Indian warfare.

"For its service uninstructed cavalry and infantry officers and men (although great complaint was made that there were too few of these for their own duties) have been detailed, and with chance horses from the quartermaster's corrals, some attempt has been made to use it, with not, I believe, very creditable results to either gun or gunner, and this while five dismounted light batteries were lying idle so far as their proper duties were concerned. At the Custer massacre, Reno reached the neighboring 'bluffs' and saved his command. Custer, when attacked by overwhelming numbers, tried to do so, failed, and *his* command was exterminated. A battery or half battery of Gatlings would have been a moving 'bluff,' with power to fight and specially fit for keeping 'swarms' of Indians in check. The guns would not have 'staggered about' from weariness after a long forced march, as Sitting Bull describes our soldiers to have done. Nor would they have lacked the rapidity of fire which that chief claimed.* Under their protection our men could have moved about in comparative safety, or at least to cover. The presence of such a battery would probably have saved the command, and, perhaps, as a battery of six-pounders did at Buena Vista, 'saved the day' † as well.

"I know of no good reason why one should not have been on the ground, if they had been kept mounted in accordance with the expressed will of Congress."

In letters written subsequent to this report, General Hunt has expressed his views as follows: "I doubt if these batteries would cost much more than infantry—they certainly would cost much less than cavalry, and be in certain circumstances infinitely more valuable. The whole question lies in this—granted the value of the guns in such circumstances, if properly horsed, equipped, and served by *trained artilleryists*, would the mobility be such that it could be depended on to operate with—that is, to keep up with the troops? if so, it is a settled question."

The opinions of Generals Sherman and Benét are shown in

* The Indians were armed to a great extent with the Winchester magazine rifle.

† Light battery C, 3d U. S. Artillery. See official report of General Taylor.

the following extracts from official correspondence during the year 1881.

General Benét, Chief of Ordnance, U. S. A., endorsed on a communication as follows: "As reference is made to an infantry school of practice, I desire to give expression to an opinion that batteries of machine guns of small calibre should be organized to serve with infantry and cavalry, and should form an important part of such a school of practice," as that then proposed to be established at Fort Leavenworth.

General Sherman, in returning the communication referred to, stated: "The General of the Army concurs with you perfectly that artillery companies, provided with machine guns drawn by horses, should form part of almost every expedition of any size. It is his wish to establish a school of instruction, composed of four companies of cavalry, four of infantry, and one company of artillery, equipped with machine guns of the lightest possible weight and greatest mobility." If a number of well-commanded, properly organized machine-gun batteries had been kept at points easily accessible to the Indian country, they would have rendered valuable service. Many competent officers could have been found to command these batteries. Men who commanded horse batteries of light 12-pdrs., or 3" guns during our last war, and who never failed to keep up with the cavalry by day or night, no matter how rough the road might be, or when there was no road—amid snow, ice, mud, and storm, in winter and summer, could certainly have accompanied our troops serving in the South and West with light machine guns in nearly all of their marches.

Thus far the machine gun has not had an opportunity to win for itself an enviable reputation in our Service, but it is not believed that the gun is responsible.

We have had no properly commanded, organized, manned, and equipped battery of these guns in action.

The attempts made to introduce machine guns into our army for field service, have met with the fate that has generally befallen all innovations when first used.

Many obstacles have been encountered, one being the indisposition on the part of officers to see, or comprehend, the true value of the guns, together with a general ignorance regarding them, and an utter lack of practical knowledge. The prevailing opinion frequently expressed seems to be, or to have been, that

they are all very well to defend roads, defiles, and bridges, but for nothing else.

This is the result of ignorance and of the instinct to oppose and disparage any thing new.

Generally speaking, not one officer in a hundred has any special knowledge of the subject of machine guns, and very little is known of their construction, capabilities, or proper uses. The guns issued to the army are either used to ornament posts, being placed in the charge of some deserving soldier, who, by using plenty of cleaning material and paint, manages to keep them in apparent good order and condition, or they are carefully housed and greased to prevent rusting.

The knowledge generally obtained of our machine guns is by an occasional glance at them, when visitors are being shown around the post. At some posts the guns are at times used for drill, but generally in the manual of the piece. Possibly at points where it can be done, some target practice is had, but as a whole the instruction given in the army is exceedingly limited.

It has been the fashion to decry the guns, and underrate their ranges and execution.

History but repeats itself; the musket had a similar struggle with the bow, and the breech-loader with the muzzle-loader.

The existing opposition to the introduction of these guns will cease, when they are better understood and their true value appreciated. It is only a comparatively short time since General Scott refused to arm his troops with the percussion muzzle-loader, preferring the old flint-lock with its twelve loading motions. That we are not the only people that hesitate before adopting new inventions is well illustrated by Col. Hope, R. A., who says: "Shortly after the Crimean War I was attached to the legation at Washington, and it was my duty to report, among other things, on a breech-loading arm invented by a Mr. Morse, of Louisiana. It was nearly the same as the present Springfield of the United States Army. I reported very strongly in its favor, made diagrams, and went into a long argument in favor of breech-loaders as against muzzle-loaders; and I pointed out that although there might be a waste of ammunition, yet if other nations adopted breech-loaders, we must necessarily do so also. I was ordered to buy a rifle and a thousand rounds of ammunition and send them home, which I did. It was referred to the usual committee, which sat the usual number of months, and made the usual

report. They said it was a very ingenious rifle. I had said that I loaded it under water, plunged it in the river Potomac, opened it in the river, loaded it in the river, and it worked very well; that I had loaded it on horseback. They said it would do all that, but it was not adapted to the British service for the three following reasons: (1) It fired too quickly—twelve shots a minute; (2) the cartridges were metallic; (3) they contained the principle of their own ignition. The committee did not explain why these reasons rendered it inapplicable; they simply stated that because of those three reasons it was not adapted to the British Army.

"In 1866, after the Austro-German war, I was staying at Malvern, and there came the celebrated war-office advertisement, inviting public competition for breech-loading small-arms, leaving every thing open—the length, weight, calibre, system, and every thing—but stating that all competing rifles must comply with three *sine-qua-non* conditions: (1) They must not fire less than twelve shots a minute; (2) the cartridges must be metallic; (3) they must contain the principle of their own ignition."

Whenever machine guns have been attached to expeditions (except Mackenzie's in 1878), every thing has been extemporized. Officers unaccustomed to such service have been placed in command, suitable horses have not been provided, and men have been detailed from the infantry or cavalry to serve them, often to their intense disgust.

Ignorance regarding the gun, its possibilities and advantages, have created distrust, and the impedimenta and lack of requisite knowledge as to management in the field have almost always resulted unfavorably to the gun.

Some machine guns were sent out just before the Custer expedition started, but as the officers and men knew nothing about them, they were not taken along. What the result would have been had they accompanied that ill-fated command can only be conjectured, but experience warrants the belief that they would have saved at least part of the troops. The fault, as before stated, has been, that those who have suddenly been placed in charge of the guns knew nothing about them, and commanding officers, equally ignorant, could not trust them. Men will not fight well with a weapon they know nothing about and consequently distrust. No weapon requires a more perfect knowledge of its mechanism and possibilities, and it is not to be won-

dered at that no satisfactory results have followed the course so far pursued.

Another obstacle has been the multiplicity of guns, carriages, feeds, and models.

We have now the Gatling and improved Gardner systems of guns only, which simplifies matters to a great extent. At one time, in addition to these, we were experimenting with the Lowell, the Taylor, and other systems.

This trouble has not been entirely overcome, for we have Gatling guns of different models, and gun-mounts and feeds of various kinds. We have also carriages, limbers, and carts of different styles and materials, some being constructed of wood and some of metal, some manufactured at our arsenals and some by private firms.

We have tripods and harness of various styles. This state of things could hardly have been prevented, for the guns are more or less complicated, and hitherto have been necessarily to a great extent experimental.

These well-known facts make it all the more remarkable that capable, well-trained, and experienced officers and men have not, as a rule, been placed in charge of these guns for Service in the field.

In future less trouble will be experienced, as the two systems of machine guns, rifle calibre, now adopted in our Service have attained a degree of excellence which warrants the assertion that no radical change will be made in their future construction.

The time has apparently arrived for definitely determining certain matters regarding the subject of machine guns, including constructions of all kinds.

CONSTRUCTION.

If it is conceded that the gun is to be classed as an artillery weapon, we have that foundation to build upon, and it follows that to enable machine guns to be used under all conditions of field service, the following points should be settled, and all constructions made to conform to the adopted and prescribed models, to be changed only on account of manifest improvements or new inventions hereafter made.

By having different models of the same construction we cause lack of confidence and invite disaster.

1. The cartridge to be used.

Of course the rifle cartridge must be the one generally used, but reasons may be given why these guns may well use a cartridge with a larger charge than 70 grains of powder under certain circumstances. It is believed, however, that whatever advantage might be gained would not compensate for the manifest disadvantage of having two kinds of cartridges.

2. Model of gun and feed.

We have in service two models of the Gatling gun—one arranged for the Accles magazine, which cannot be fed by means of the Bruce feed or the tin feed case; the other allows of the use of the Bruce feed and tin feed case, but not of the Accles magazine.

3. How ammunition should be packed.

If the Accles magazine is to be used it does not make so much difference how the cartridges are packed, for it requires filling before it can be used, but if the Bruce feed is to be used it becomes a matter of the very greatest importance, for then the gun will be fed direct from the package, on the same principle as that now used in the Improved Gardner system. Gun-carriages, limbers, or other vehicles required for the field service of these guns, all depend, as to their construction, on this question.

It may be relied on, as an established fact, that no system of feeding machine guns which does not allow the taking of the cartridges direct from the package, will ever prove efficient and satisfactory for field service.

4. The gun-mounts.

These should be manufactured by the government or the manufacturers of machine guns should be required to furnish the mounts according to a prescribed model. There are several different styles of Gatling gun-mounts now in the service.

High gun-mounts are objectionable, the gun is thereby carried so high that feeding is made inconvenient, and consequently less rapid; the carriage is more liable to be overturned and a larger target presented. It is not believed that it is necessary in our Service to provide for an all-round fire without trailing.

These light guns, on light carriages, are easily and quickly trailed.

The ordnance model carriage, 1884, allows of a movement of 35° to the right and 28° to the left, without moving the trail.

Neither is it necessary to provide for a higher degree of elevation or greater depression. In case very high elevation is required the trail can be sunk in a very short time, and with safety, for when a gun is to be fired at such degrees of elevation it implies that the conditions are such that there will be no hurry.

5. *The carriage.*

We should have but one carriage, and that so constructed that either gun can be placed on it. This carriage should, in material, construction, and equipment, embody the most valuable practical ideas of those best qualified to judge of the requirements of machine-gun service.

6. *The limbers.*

These should be identical with the ammunition supply carts, for reasons given hereafter.

The field service of machine guns, and any efficient system of supply of ammunition to troops in battle, are kindred subjects intimately connected one with the other.

The machine gun, its mount, its carriage, the limber, the feed, and the system of packing and transportation of ammunition, should be the same for the Army and the National Guard.

The work here outlined should be accomplished as soon as possible, for no man knows when the services of these powerful weapons may be required to protect public interests, private property, and the lives of our people. As soon as a sufficient number of constructions, made according to the adopted models, can be provided, all then issued of other styles should be replaced by the new ones.

It is believed that some changes calculated to make both the Gatling and Improved Gardner better suited to all the conditions of field service, may be made by the manufacturers of them. Attention should be given to the subject of disabling the guns in case they are likely to fall into the hands of the enemy.

The idea that batteries should never run the risk of capture, and that disgrace attends the loss of guns is not well founded. Artillery, in common with the other arms, has its part to perform, and pushing forward batteries is absolutely necessary at times, although attended with risk. In case machine guns are fought

as they should be, they incur this risk to a much greater degree than field guns.

An English battery at Waterloo was several times in the possession of the French, but was useless to them as the linch-pins, sponges, and rammers, etc., etc., were carried away each time before capture.

The Gatling and Improved Gardner should be so arranged that the cranks can be easily and quickly removed under all circumstances. The fastening should be larger.

The hopper of the Gatling and the swinging casing cover of the Improved Gardner should be easily detachable—that is, they should be so arranged that they can be easily removed by any one under adverse circumstances; the fastening should be large and if a pin is used it should have a ring, or chain, to pull it out with. The casing of the barrels should be dark; there should be nothing about the gun to shine or glisten to attract attention.

During our last war the Confederate rifle batteries, being able to distinguish our light 12-pounder batteries (brass), would take their positions just outside our range but within their own. This being soon discovered by our artillerists our brass guns were blackened. The machine gun possesses great advantages for field use, among which may be mentioned the lightness of its parts, economy in men serving it, and horses for transport, its great mobility, the simplicity and strength of its mechanism, the rapidity and continuity of its fire, lack of recoil, the effectiveness of its fire against troops, even at long ranges, its accuracy at all ranges attainable by rifles, its independence of the excitement of battle, the interchangeableness of its ammunition with small-arms, and its great endurance.

In a trial of a Gatling gun as to its durability before a board of naval officers 63,600 rounds were fired in less than four consecutive hours; the official report says, "the working of the gun throughout this severe trial was eminently satisfactory, no derangement of any importance whatever occurring."

The Pratt & Whitney Company have an Improved Gardner gun now in use that has been fired over 80,000 times and is still serviceable.

Machine guns have no shoulders to be bruised, by repeated discharges, to turn "black and blue," and swell all out of shape and proportion.

MACHINE-GUN SERVICE.

It is conceded that these guns are valuable for the defence of field fortifications placed in defensive relations to each other, entrenched positions, with long lines of defence, the defence of villages, protecting roads, defiles, or bridges, or the crossing of streams, covering the embarkation and debarkation of troops and material, for silencing batteries of position, or field batteries, or supporting them, repelling charges, covering retreats, service with the advance, or on the flanks, moral effect of its fire on our own troops and the enemy, etc., etc.

Surely such advantages should be utilized and not thrown aside because the weapon is a new one. We must learn to use it. These guns will prove of the greatest value to us if properly commanded, organized, equipped, and fought, in intensifying infantry fire, making up for lack of discipline, and preventing disaster resulting from a waste of ammunition or an inefficient supply.

Any system of supply, no matter how efficient, will be severely taxed to keep our firing lines supplied, and if it fail, the consequences will be disastrous, unless some special system be adopted to maintain our equality, if not to give us a superiority.

In accordance with our established policy, the nation will always depend on volunteers in case of wars or troubles of greater magnitude than can be successfully managed by the Army and the National Guard.

The average American volunteer is a man of fair education, good judgment, quick to learn, and willing to submit to a certain degree of discipline, but he never loses sight of the fact that he is a free-born American citizen, and that whatever surrender he makes of his independence is voluntary. He is capable of individual action, and has his own opinion of men and things. He is no "machine," according to the military acceptance of the term. These characteristics, which may increase his value in some ways and under certain circumstances, have a contrary tendency in others, the very independence of the men making it almost impossible to attain such a state of discipline that perfect control can be maintained by their officers at all times.

The whole tendency of modern tactics is toward making the individual soldier self-reliant, and, to a certain degree, independent of control, and forcing him to act according to his own judgment, especially when under fire. Dispersed lines, swarms, and

rushes require individual action and a certain degree of freedom from control.

It is evident that these facts tend to lessen the control of the officers, and to make the enforcement of "fire-discipline" exceedingly doubtful, if not absolutely impossible.

The election of the company officers (who of all others are the most important men in an army) by the enlisted men, and the fact that companies are generally composed of men from the same town or locality, has a tendency to weaken discipline.

The officers are naturally selected on account of their popularity, by the men who are their friends or acquaintances at home, and the characteristics likely to ensure the strict enforcement of discipline are not apt to make men popular.

The fact that as soon as the service is finished and the organization is mustered out, the officers and men return to civil life, where military rank does not exist, deters officers from disciplinary measures, which may create resentments which will have a more or less lasting effect upon them and their success in life.

Non-commissioned officers are not always selected because of their superior soldierly qualities. Their selection and promotion depend very much on the same conditions as obtain with the officers, and the results are the same. Applying these facts to the possibility of enforcing "fire-discipline," how slight that possibility is becomes painfully apparent.

In the dispersed order now rendered necessary by the introduction of arms of precision, the company officers and non-commissioned officers are really the ones who exercise whatever direct control of the men is possible. Even the captain has but partial control of his men, and that of the lieutenants is very limited. The officers above the rank of captain can have but a very general control. The non-commissioned officers are the group leaders and have the most direct control of the men. Considering the characteristics of the men, and the manifold difficulties encountered by the non-commissioned officers, owing to the faults of volunteer-company organization, and the fact that these forces are mustered into the U. S. Service for comparatively short terms of service, how futile the hope appears, that a necessarily strict degree of discipline will ever be attained.

In this probable inferiority in discipline lies our weakness, which will become apparent if we are brought in conflict with the well-disciplined soldiers of Europe.

This is the inferiority that must be provided for by some means calculated to place us at least on an equality.

Without doubt, a properly organized machine-gun service, with commanders well qualified for their positions, will best supply the want. The effects of infantry fire have been found small in proportion with what might be expected in battle, caused chiefly by excitement, wind, and mistakes in individual judgment, the result of inexperience and want of skill.

No matter how excellent the rifle placed in the hands of troops may be, and notwithstanding the fact that it may be improved to any conceivable degree, the men that use them will remain subject to those common weaknesses of humanity, over which even strict discipline will have but a limited power.

There has been an enormous amount of useless firing at long ranges during recent wars, chiefly caused by lack of discipline.

Colonel Sir Lumley Graham, Bart., writes: "As for the measures which should be pursued in time of peace to insure what is called 'fire-discipline' in war—that is to say, to insure for the commander complete control over the fire of his men, no one has been able to give me a positive answer. The general opinion seems to be that the officer who can keep his men in hand in other respects will, up to a certain point, be able to do so likewise in this matter.

"No fixed rules have ever been given out upon this subject, and no one thinks of laying down any. 'Fire-discipline' is looked upon by all as only a branch of general discipline and to be attainable by the same means—that is, by the whole system of military education in peace times,—the constant object of which should be to make the soldier everywhere and under all circumstances obedient to the voice of his immediate commander, attentive to his orders, and confiding fully upon him. All the efforts of an officer should be directed to gain this moral ascendancy over his men: thus only will he succeed in controlling their fire *to a great extent*. We italicize these last words because all Prussian officers are fully agreed that there are certain critical moments in action when excitement is so great, emotion so strong, that it is not in the power of every man to preserve the coolness necessary for calm attention to orders. Even at peace manœuvres we frequently see soldiers, during heavy firing, mistake some noise or other for a word of command. How much more of this must happen amidst the tumultuous scenes of actual

battle, and though great stress is laid, in peace times, on the methodical execution of volley firing, no one believes in the possibility of the same being carried out in war.

"During the whole of the late war (1870-71) only one solitary example is cited. A captain takes credit to himself for having been able to make his company fire a volley on some French cavalry at the battle of Sedan: and even this exceptional volley was, by the captain's own admission, by no means a clean one, and soon degenerated into rapid independent fire."

Lacking so many of the conditions upon which control is dependent, how can we expect to find it successfully exercised in our Service?

The reasons why this desired control cannot be gained, apply to man generally. Our volunteers can have but little, if any, of the necessary instruction in times of peace—their officers cannot gain the moral ascendancy indispensable. The lack of necessary discipline in our troops will, among other things, cause a great waste of ammunition, not only because of the nervousness, lack of skill, and inexperience of the men, but of the increased rapidity with which they can fire, caused by the introduction of the breech-loader, and the impending displacement of that system by the magazine gun. Some officers of our army have for years fully appreciated the value of machine guns, and have, so far as possible, done all that could be done to push forward their introduction. The late Major-General Ord, U. S. A., while in command of the Department of Texas in 1878, assigned to batteries E, F, and G, 2d Artillery, two Gatling guns each.

Previous to this he had assigned to a well-known and dashing officer, Lieut. Frank H. Mills, 24th U. S. Infantry, the command of a platoon of Gatlings intended for serving with the cavalry operating along the Rio Grande River under command of General Mackenzie, U. S. Army. This platoon was organized and equipped as horse artillery—the men being selected from the infantry. It possessed remarkable mobility, and its drill was peculiar. Without doubt it would have rendered excellent service, and made an enviable record for itself, had it been fortunate enough to have had the opportunity.

During the year 1878 Lieut. Mills' platoon was transferred to Battery F, 2d Artillery, which had been ordered from San Antonio to Fort Clark, Texas, and, during that year, this battery was equipped as a six-gun (machine) horse battery. Great in-

terest was manifested by Generals Ord and Mackenzie in this battery. Long and hard marches proved the value of the peculiar equipment and were convincing as to mobility. Frequent target practice produced gratifying results.

General Mackenzie was so convinced of the value of such a battery, that, when ordered out of Texas with his regiment with the prospect of being engaged in hostilities with the Indians, he applied to have the battery form part of his command.

The battery was ordered to San Antonio in 1880, and its armament changed by the addition of two Hotchkiss revolving cannon and the same number of Improved Gardner guns. In May of the same year the battery was ordered to proceed to Corpus Christi, Texas—the object being, as stated in the order, to “establish a camp for instruction and practice.” Corpus Christi was selected by General Ord as the best location, as there a very fine target range could be obtained, along a hard, level beach, for over 5,000 yards.

Soon after the battery arrived at its destination its armament was still further increased, and its commander was intrusted by the Chief of Ordnance, U. S. A., with the field trials of the various systems of machine guns, to which the attention of the Department had been invited. Advantage was taken of the superior target facilities afforded to test the guns fully under, as nearly as possible, the conditions of active field service.

General Ord attached one lieutenant of infantry to the battery for instruction, and intended ordering others to do duty with it, but his retirement from active service prevented the carrying out of his plans.

Among the other organizations concentrated at Fort Leavenworth in 1881 to form the basis for the School of Application was Light Battery F, 2d Artillery. This battery has field as well as machine guns, and for over four years has been engaged in giving practical and theoretical instruction to the young officers there assembled.

This battery was the first and is the only fully organized and equipped horse battery of machine guns in our Service.

All machine-gun batteries for our Service should be equipped as horse artillery.

Mobility is the main desideratum; the principal results to be attained, efficiency of fire and celerity of movement. Horse artillery has a superiority in mobility which renders it practically

independent of supports, the condition of the ground, and the formation of the country. The value of mobility has increased. Modern warfare makes it necessary for batteries to accompany mounted troops on long and rapid marches. "The area of country covered by troops both in attack and defence is now so large, that to rapidly transfer batteries to threatened and vital points, or to take part in wide ranging flank movements, requires the greatest possible mobility. The extension of long lines of battle, the timely seizure of important tactical positions, the supporting of troops unexpectedly pressed, the carrying out of false attacks, the aiding in pursuit, or the covering a retreat, are also occasions in which horse artillery can with advantage play a part." *

Mobility allows of and induces a distinctive boldness of action and a more tenacious holding of positions. Granted that a necessity exists for the employment of these batteries in our Service, it seems naturally to follow that they must be horse batteries—they must be used for hard and desperate work.

From the nature of the service required of these batteries they will frequently be without supports. This was very common during our last war, when batteries of field guns frequently went into position, on or in advance of the skirmish line. Machine guns will often be placed in similar positions.

Machine-gun service, being a peculiar one, the value of which will depend on its mobility, dash, and devotion, the officers selected to serve with these batteries should possess special qualifications. The commander should be an experienced officer fully alive to the character of the service demanded, and aware of the responsibilities of the position; he should be a good disciplinarian, attentive to every duty, knowing how to take the best care of horses, of untiring energy, and full of expedients; ever vigilant, and ready for any duty no matter how hard or desperate.

His lieutenants should be men ready to assist the commander in every duty, possessing all of his qualifications except, possibly, experience, and capable of taking their subdivisions wherever a wheel can go.

Men of this kind are now, always have been, and always will be found in the American Army; brave to a fault, dashing yet sensible, boldness itself yet cool-headed, a noble class to whom may safely be given the honor of defending our country, our

* Capt. Pratt, R. A.

lives, and our property. These men have always been found when their services were needed, and always will be.

This service, which may be designated as Machine-Gun Service, must, to ensure its maximum value, be an *élite corps*.

This corps is supposed to be a volunteer organization, to be called into existence only when a war of sufficient magnitude occurs to render it necessary. At other times the Army will be able to supply the necessary batteries, in case a larger number than those belonging to the National Guard are required.

This corps should have a distinctive uniform, and the guidons should differ from those of the cavalry or light artillery. Such matters may be considered as of little consequence, but they are of importance, inasmuch as they promote *esprit-de-corps*.

This service must be popular, and as the weapon is not strictly one belonging to either arm, it should be officered by selections from all three. This would promote the highest degree of efficiency, and would be the best policy, if it were not an absolute necessity. Although this gun has been assigned to the artillery, and for various reasons justly so, it would be found impossible in case of war, when these batteries formed a sufficiently large proportion of the forces, to find enough well-qualified artillery officers to command them. We have but sixty captains, one hundred and thirty first-lieutenants, and sixty-five second-lieutenants. Take from this number those who would go into the volunteers with higher rank—those unable to take the field—those commanding field batteries, or on duty in fortifications, together with those having no experience or special fitness, and a very insufficient number remains to enter this service.

In our army, when each arm, at times, does the duties of the others, the officers of cavalry and infantry possess a greater knowledge of what would be required if serving with machine guns than could be found in any other service.

All graduates of West Point receive the same instruction in the three arms.

It would be for the interests of the Service to confine the selection for battery commanders in this service to the grade of lieutenant, for in that grade, with few exceptions, will be found the men best qualified.

While in command of these batteries they should have the rank and pay of captains mounted, and the lieutenants should receive the mounted pay of the grade.

These batteries should form one corps, and be designated numerically.

The higher officers should be selected from the best-qualified officers of the army.

The chief of the corps should be a Brigadier-General stationed in Washington.

The chief of the service on the staff of an army commander should be a Colonel.

The chief of the service on the staff of a corps commander should have the rank of Lieut.-Colonel, and those on the staffs of division commanders the rank of Major.

The batteries should be assigned to divisions at the rate of one to a division.

There should be a corps reserve of at least two batteries, and an army reserve at the rate of at least two batteries for each corps.

These batteries should be solely under the orders of the army corps or division commanders according to which they belong.

These machine-gun batteries should consist of twelve (12) guns each.

The number of carriages and horses will be about the same number as required for a field battery, the command will be about the same, but the principal advantage derived from having this number of guns is the power of subdivision. Such a battery can be divided into two batteries of six guns each, or three of four guns each, or into six platoons of two guns each.

Each gun should be drawn by four horses. Two horses are not sufficient to provide for the necessary mobility; and the other uses to which the leaders may be put, besides assisting to transport the gun, make four horses absolutely necessary. Circumstances permitting, the teams should be kept under cover; when necessary to have the wheelers near the guns they should be faced to the rear, the limber being two yards from the handspike. This in a measure protects the horses and drivers, as the shield on the gun, the limber chest, and its raised lid interpose between them and a portion of the enemy's line.

The ammunition is close at hand, and conveniently placed; it is as safe as it would be in any other position near the gun; the only cartridges damaged by hostile fire will be those hit.

Guns can be more quickly and easily limbered. The guns are so light that they can be advanced or run back by the men gen-

erally. When necessary the horses can be used to move them in any direction without limbering if desired, but the teams should be covered as much as possible. In all kinds of horse-artillery, mobility is the first thing to be considered, being the cause of superiority, and it must always be remembered that the horse is the motor. If a number of horses are disabled the superiority ceases, and the battery is liable to become useless.

Only enough men should be kept under fire to properly work the guns; the loss will be less, and those with the gun will incur less risk of becoming demoralized. The spare men should, however, be kept within reach.

These batteries should never be allowed to interfere with the movements of troops or trains. Four horses can take the gun almost anywhere, and they can be kept away from bodies of moving troops.

MACHINE-GUN INSTRUCTION.

There are now two schools at which lieutenants are receiving instruction in various branches pertaining to their profession, the Artillery School at Fort Monroe, Va., and the School of Application at Fort Leavenworth, Kansas. There is a hope that a light artillery school will soon be established, as well as a cavalry school, and it might be made the duty of the staffs of these schools to recommend at the end of the course such lieutenants as they believe to be best qualified for this service. Commanding officers might also be required to recommend such lieutenants as they judge are possessed of the necessary qualifications; these recommendations to be kept, for the information of the proper authorities.

Without any intention of entering into an argument, to prove why there should be a school for our light batteries, it is necessary to refer to their present condition. We have ten light batteries, no two at the same post; they are (save experimentally) equipped with the same guns, carriages, harness, etc., which were used during our last war; they are allowed only sixty-five men, fifty horses, and four guns.

Very few of them have even a suitable drill ground. This condition of affairs is not creditable, nor is it for the interests of the Service that this arm be longer neglected.

If one half, or the whole number of these batteries could be assembled at some suitable place, and a school established, mari-

fest improvements would ensue. In addition to being supplied with modern field guns, they might be furnished with machine guns also.

This would form a powerful force, for use in case of Indian troubles, or in case of disorder caused by that class which at times manifests a desire to set the laws at defiance.

The course of instruction at the school will doubtless be for two years; during this period it can be so arranged that the artillery lieutenants can receive all the instruction, both theoretical and practical, regarding the different systems of machine guns, necessary to fit them to command batteries.

It is to be hoped that in case a school is established, some locality may be selected for it where the climate will allow of the larger part of the year being occupied by service in the field. Marching, camping, and target practice, is what is needed, and nothing should be omitted to render the practical course full and complete.

In addition, it would be well to send to this school ten infantry and cavalry lieutenants for a course of instruction, to continue one year. The knowledge these young men would acquire, in regard to machine guns of all the adopted systems, together with the valuable experience they would have in the management, care of, and proper use of horses and material, the administration, etc., of light artillery, would well repay the government for the expense, if any, incurred.

The selection of these lieutenants should be made by the staffs of the other schools, those best qualified in all respects to be named.

The duty will be agreeable, the course interesting, and there is little doubt but that it would be popular. The course should be mainly practical.

THE NATIONAL GUARD.

As the National Guard are, or should be, interested in the subject of machine guns, it would be beneficial to the country at large if one officer belonging to it be selected by the Governor of each State, having machine-gun batteries, to attend the course, herein outlined, for lieutenants of cavalry and infantry. After receiving this instruction to return to their State, and serve as instructors.

This would supply each State with a capable instructor every year.

It is manifestly for the public interest that the National Guard be supplied with the same arms, same calibre, same ammunition, and same equipments of all kinds as those issued to the Army. The National Guard, in addition to its local duties, which may be of the greatest importance and value, form the second line for national defence. The men composing it should become familiarized with the armament and equipment of the Army, with which they will be supplied in case of war. No one would expect good work from a mechanic who had only new and strange tools to work with. In these days, when science has placed at the disposal of irresponsible persons, cheap materials for the manufacture of powerful explosives, and in a nation where every man can purchase arms and ammunition of the most improved kinds, the National Guard should be armed and equipped in the very best manner.

Machine-gun batteries should be organized among the National Guard, and the government should assist them to become efficient, by furnishing them with guns, carriages, and full equipments, ammunition for practice, and competent instructors. The Guard should understand these guns, and how to use them for all they are worth, and no time should be lost, for no one knows when their services may be required. As before stated, we have two systems of machine guns in the Service.

MACHINE-GUN SYSTEMS.

The Gatling has ten barrels, and can be fired at a rate of from 1,000 to 1,500 shots per minute.

The Improved Gardner gun has two barrels, and can be fired at a rate of about 400 shots per minute.

The accuracy of these two guns is about the same.

The Gatling has the advantage of greater rapidity of fire; the Improved Gardner is lighter and more simple.

Neither gun is likely to get out of order in the field, with proper care and intelligent use. Minor repairs of either gun can easily be made by a person understanding the mechanism and supplied with the necessary spare parts, which are small and weigh but little.

The method employed in feeding the Improved Gardner is excellent, allowing the gun to be fed direct from the package, thus insuring a constant fire so long as desired.

The Gatling has three feeds: 1st. The tin feed case, holding

forty rounds. This case is very objectionable, and may be considered as obsolete ; it is only mentioned because a large number are on hand.

2d. The Bruce feed.—This feed, together with a recent and most valuable improvement made in the Gatling gun by Col. A. R. Buffington, Ordnance Department, U. S. A., renders it practicable to feed the gun direct from the package with regularity and the necessary rapidity, an advantage not hitherto possessed. Regarding this improvement, Dr. Gatling writes: "A recent and very valuable improvement has been made which enables the feeding of the cartridges to go on while the gun is kept under continuous revolution, without the least danger of jamming." Repeated trials have been made by experts to determine whether it be possible to cause an accidental stoppage or imperfect action in the feed by an irregular or jerking method of turning the crank, but no imperfect action has been produced.

3d. The Accles magazine is conceded to possess all of the advantages claimed for it, and the Ordnance Board report that it "adds very considerably to the value of the gun.

"During the trial the gun was fired at various degrees of elevation from 1° to 89° . The gun was dismounted, placed upside down on a staging, and fired with as much facility, and the feed (magazine) worked as well, as when placed on top, showing clearly that its action was positive and entirely independent of the force of gravity. No other feed that is known would operate in this manner, and though it is an exaggerated case, and one not likely to occur in service, yet it shows how effectually the cartridge is held from the time it is placed in the feed-magazine to its delivery in the carrier-block (receiver), and how impossible for any clogging or over-riding to occur, as is the case at times with other feeds. The gun-carriage and feed-magazines are so admirably adapted to the requirements they are designed to fulfil, that the Board would recommend the gradual replacement of those in service by these new constructions." These are certainly strong endorsements and from very high authority, but objections may be urged against the use of this magazine as suitable or adapted for field service. The action of the Accles magazine is positive, not depending on gravity, and consequently vertical and high-angle fire can be made use of if desirable.

This magazine is a complicated, bulky, expensive, and heavy construction. It is a metal drum $12\frac{3}{4}$ by 3 inches, weighs 16 pounds unfilled, and holds 104 cartridges.

The space it occupies in limber-chests and axle-boxes can be better utilized by being devoted to ammunition. In the model steel carriage (Ordnance, 1884) four of these magazines occupy in the limber-chest space that would hold 2,896 rounds, one magazine taking up room in which could be packed 724 rounds. This limber-chest carries in four magazines, weighing (unfilled) 64 pounds, 416 cartridges, occupying the space in which might be packed 2,896 rounds. This magazine, to be used, must be filled, and the operation is not an easy one, or one quickly done, particularly under fire. Dr. Gatling claims that "it takes about two minutes to fill the Accles magazine by hand, but an expert can do it in less time." It is said that a small machine is used at the Colt Armory, where the Gatling guns are manufactured, for filling these magazines, and that one can be filled by it in twenty seconds, but it would be hardly practicable to carry these machines in the field.

This rapidity of filling does not seem to be obtainable at other places. At the Watervliet Arsenal, Captain Michaelis, Ordnance Department, in a trial for rapidity in filling the magazine, filled one in 3 minutes and 50 seconds, and one in 3 minutes and 20 seconds. At the same time Captain Metcalfe, Ordnance Department, filled one in 3 minutes and 58 seconds, and one in 3 minutes and 40 seconds. At the National Armory Mr. Bruce filled one in 3 minutes and 10 seconds. These were trials by experts, with every thing in their favor.

How long would it take the average enlisted man to fill one of these magazines in action, under fire, and disturbed by all the excitement and circumstances of battle? Under such circumstances it is fair to infer that a large proportion of the magazines never would be filled.

This magazine is liable to be damaged, not only in battle, but at any other time, by being dented or jammed. In action it presents its side to hostile shots, and is easily disabled.

The magazine might be improved by having some arrangement to feed it from the package of twenty rounds, but the size of the magazine, already large, would be increased by the addition of a feeding arrangement, and would be objectionable for that reason.

Besides, the magazine feed would be too high for convenience.

Finally, this magazine is not suited for field service, and is not

needed. It can do nothing that cannot be done by other and more simple means.

The manner of feeding the Improved Gardner gun is almost perfect. The gun is fed direct from the package. With good ammunition it never clogs or jams, and a continuous fire can be kept up so long as desired.

The Bruce feed enables the Gatling gun, with the Buffington improvement, to be fed in the same manner and with the same results.

The Bruce and Improved Gardner feeds are small, compact, and strong, are not likely to be damaged, and occupy but small space, and they are not complicated. With these feeds the guns are freely fed at 30° elevation and 40° depression—in fact, as freely as when on a level.

It is established by trial that with these feeds the guns can be fed at any angle up to 90°, by *applying pressure to the column of cartridges*. Until the recent improvements the occasional jamming of the guns with gravity feeds was an objection, but it is safe to assert that no such action will occur in the future with the improved guns and feeds.

MACHINE-GUN FIRE.

It is possible that circumstances may be such that the use of high-angle fire may be desirable, and it should be allowed for in constructions.

The great value of long-range fire is acknowledged, but when necessary to use it it can be delivered much better, with greater accuracy and effect, by machine guns than by infantry. The guns can be well protected by placing them behind works or in pits, in positions where it would be almost impossible to dislodge them or silence them by means of any kind of fire. These guns, being light and comparatively small, are well suited for taking advantage of natural and artificial cover. When covered, the men are free from those conditions which tend to distract their attention and strain their nerves. Very slight cover is a great protection. Mercer's troop of horse artillery at Waterloo was saved from annihilation by a little bank in front, which caused most of the enemy's projectiles to glance over it. One of our batteries at Fredericksburg was saved by a slight rise of ground from utter destruction, being exposed to the fire of twelve guns placed on its right flank.

On the heights of La Villette, during the battle of Gravelotte, a battery of mitrailleurs placed behind small epaulements received no injury from the concentrated fire of 120 field guns, and repulsed repeated infantry attacks. The slight smoke made by these guns, the ease with which they may be partly or wholly hidden from view, and the protection afforded by their shields, seem to warrant the belief that they need not present a conspicuous target, or be easily driven off, even in the open.

In one of the battles before Orleans, Col. Reilly, R. A., saw "distinctly batteries of mitrailleurs in the open employed for a considerable time within 1,200 yards of the Prussian horse-artillery, and the horse-artillery did not touch them the whole time." It has not been established by experience that machine-gun batteries can be demolished or overcome by field batteries at all times; on the contrary, it shows us that they can hold their own and possibly come off the victors. Their range and rapidity of fire is so great that it might be impracticable for a field battery to attempt to come into action within effective range. During the recent campaign in Egypt, the steamer *Lotus*, on the Nile, was attacked by 1,000 rebels with two Krupp guns, and were driven off by a few riflemen and a Gardner gun worked by negro troops.

The effective range of modern artillery is not limited to the power of the gun, but to the ability of the gunner to see and observe. Generally, a gun cannot be aimed at an object not visible, and without observation of the effect the necessary correction cannot be made. The state of the atmosphere, the light, color, etc., causes the limit of effective range to vary, but it may be given at the outside at 3,000 yards. It is in the power of machine guns to rain bullets not only at this distance, but up to 3,700 yards, with a penetration of two inches in spruce plank, and from five to six inches in sand, the angle of fall being about 65°.

Within the past few years, the precision of infantry fire has wonderfully increased, but it does not follow that these batteries cannot maintain their positions within the zone of infantry fire. A shield constructed of steel plate $\frac{3}{8}$ " and weighing less than 150 pounds, will give security against infantry fire, except at very close ranges. It is very common to hear infantry officers express opinions, based on calculations deduced from target practice. These opinions are not always correct, for the disturbing

influences of battle tend to produce less accuracy. The Prussians fought their batteries at 800 to 1,000 yards from the French, although being at times severely punished.

Troops will be more or less under fire up to 3,500 yards, and, in consequence, open-order tactics have taken the place of others.

It is necessary to bring a marked superiority of fire to bear to cause demoralization. Intense "fire-power" must be productive of the greatest results, and at such points when the greatest number of bullets are delivered the maximum degree of confusion will be produced. This effect can be best produced by machine guns.

Long-range fire by the infantry necessarily causes the expenditure of a great amount of ammunition, and the danger is increased of being out of cartridges when they are most needed.

It is claimed, also, that long-range fire is apt to decrease the offensive spirit of the infantry, and that the men will get into the way of shooting wildly; and, in consequence, infantry fire will be less deadly at close ranges. Be this as it may, machine guns will make a larger proportion of hits than infantry. At a trial made at Carlsruhe, between a Gatling gun and one hundred infantry soldiers at 800 yards, the gun fired 246 shots and scored 216 hits—time, one minute; the infantry fired 721 shots and made 196 hits in the same time.

Recent wars have shown that it is the mass-fire of troops that produces the greatest results,—not individual firing. No mass-fire can compare with the fire possible from machine guns—more bullets can be thrown by them from the same front than by any other arm.

The advocates of long-range firing seem to unite in the opinion that field artillery produces the best results at short ranges. If the detachments are not disabled and can be kept up to their work, the effect at these ranges is astonishing. Experiments have been made in England, the object being to ascertain the proportionate effect of artillery fire from 1,000 yards downward—at 1,000 yards the result against dummies was 18 per cent. damage in a minute; at 600 yards, 33 per cent.; at 400 yards, 40 per cent.; at 200 yards, 50 per cent.; and at 100 yards, 75 per cent.

This proportion would be much greater using machine guns,

as will be seen by consulting the target record given herewith of practice made generally under unfavorable conditions. The fire from machine guns is far more powerful than the canister fire from any field piece, and the proportion of hits to pounds of ammunition much greater. There always has been and is a disposition to credit the artillery with only such wounds as are inflicted by it, without the possibility of a doubt. When a corpse is found torn almost in pieces, or with its head or legs off, it is considered probable that the artillery caused it—but all other wounds are credited to small arms.

Nothing could be more absurd! How can it be decided whether a wound has been inflicted by a bullet from a rifle, or a bullet from a shrapnel or from a round of canister? The same thing will occur when machine guns come to be used, but those using them will care but little provided the results are satisfactory. The invention of the Accles magazine attracted attention to the possibility of using high-angle fire, as it allowed of the feeding of the Gatling at all angles of elevation up to ninety degrees.

It is claimed by Dr. Gatling that the gun can be fired as rapidly at ninety degrees as on a level, and the report of the Ordnance Board confirms the statement. As to the possible value of the invention, Dr. Gatling says that the gun can "deliver high-angle or mortar fire, so as to drop the balls on men behind entrenched positions at all distances from 200 to 3,500 yards with deadly effect." The power of the gun to do this is not denied—that is, it can be given the necessary elevation, and when fired the balls will go up into the air, but it does not necessarily follow that they will descend only on men behind entrenched positions. Dr. Gatling states that when using a cartridge containing a charge of 85 grains of powder, and a bullet weighing 480 grains, the gun having an elevation of $88\frac{1}{2}$ degrees, the bullets fired remained up in the air 57 seconds from the time they were discharged until they struck the ground. This is all very well, provided nature does not interfere to deviate the bullets from the point they are intended to reach, and where they should descend.

We know, however, that during their ascent and descent the balls have to pass through various currents of air, the directions of which cannot well be ascertained, or corrections made for. The great inaccuracies caused by the air close to the earth's sur-

face, in cannon and small-arm firing are well known, and although the direction can be determined, and the knowledge conveyed to the shooter, and the proper allowance made therefor, still inaccuracy results. How, consequently, can any reliable conclusions be arrived at, on which to base calculations for high-angle fire? The bullets, instead of finding their resting-place in the bodies of our foes, may be caused to drift by adverse currents of air so as to come down with fearful rapidity among those serving the guns, or the supports, with "deadly effect."

Unless the aerial conditions can first be determined and found favorable, on each occasion, it is not believed that this kind of high-angle fire will ever be very popular in our Service; it savors too much of the boomerang, and cannot be depended on, as a general thing.

The machine gun is unequalled for night firing. It can be placed in position to cover any point within range, and kept in that position. The lack of recoil prevents the accuracy from being disturbed, and a constant night-fire can be maintained having the same precision as that by day.

Machine guns are particularly suited for sharp-shooting, and, if this fire is desirable, can be depended on to excel in it. Powerful telescopic sights were used at Corpus Christi, and the results were astonishing. The moral effect produced by the use of machine guns will be found to be one of the most valuable results following their introduction.

"Success," says Laymann, "depends on superiority in physical and moral strength. By the latter we understand the spirit which enables a man to overcome the natural impulses which urge him to fly from, rather than face danger. No one goes under fire intending to run away; but the sights and scenes which throng on his senses unnerve him. A shot in the flank or rear is magnified; then he notices gaps in the ranks, a storm of bullets is all at once showered on him from an unexpected quarter, and the legs run away of themselves."

There is a limit to the losses that troops can endure, and it has been proven that thirty per cent. is about the limit of endurance. Says a distinguished authority: * "An army, like a chain, is only strong in proportion to its weakest link, and if the loss of thirty per cent. be so fatal, the argument for the use of a mechanical weapon capable of bringing about the flight of opponents by a still higher destructive percentage is infinitely

* Colburn's U. S. Magazine, October, 1881.

strengthened. This is by no means a cruel doctrine; on the contrary, it is a maxim of war dictated by humanity." "What is our object in battle?" asks Colonel Brackenbury, R. A., in a recent essay. "It is to break down the enemy's moral force—to sustain that of our own troops. Shock and fire, assisted by surprise, are the means of demoralizing the foe, and, as Laymann puts it, "it is better to kill fifty men in an enemy's battalion, if that will cause the rest to run away, than to kill a hundred if the rest stand firm. But on the other hand, the physical element being absent from the use of machine guns, the most audacious spirit should animate each individual of the gun detachment and render them unconquerable."

The moral effect produced in Alexandria after the bombardment by machine guns is well known, as well as the effect produced by them on Arabi's army.

The same results would follow their use in case of mob violence in this country.

A few of the targets made by Light Battery F, 2d Artillery, have been added to show what can be expected from these guns in actual service. The practice was made to conform as nearly as possible to all the conditions of field service in time of war, and it was proceeded with in all kinds of weather and often under disadvantageous circumstances. At times the condition of the ground was exceedingly unfavorable, and the weather equally so. The targets fired at were placed so as to represent a supposed enemy, in such localities as would be occupied by a hostile force if there present, taking advantage of such cover as afforded.

Machine guns can be depended on to do as well in action as when engaged in target practice such as this, provided they are served by the proper men—that is, well-trained soldiers.

SMALL-ARM AMMUNITION SUPPLY.

For reasons already given, it is manifest that we must expect a large expenditure of ammunition in our future wars, and that some efficient system for supplying small-arm cartridges must be devised and adopted. No matter what system is selected, it should be adopted and put in operation as soon as practicable, so that those interested therein can become familiarized with it before its use in actual hostilities becomes necessary.

We never have had in our Service what may be called a complete supply system, and for our troops to get out of ammunition

has been of common occurrence, often obliging them to withdraw from under fire at the most inopportune times, yielding important positions.

These movements are often attended by great loss of life and in prisoners, as well as sacrifice of advantage, and cannot be allowed in wars, particularly when we are opposed to a well-disciplined, ever-vigilant, and energetic enemy.

Our failure as regards supply has been in not providing a sufficient means of transport from the trains to the firing lines, or to the troops engaged. Supply trains have been composed of the army six-mule teams, which are very well adapted for the purpose. These trains have been brought as near to the front as compatible with safety, and from these wagons to the troops the ammunition has been carried in the packing boxes, holding 1,000 rounds, by men on foot detailed for the purpose.

This has always proved to be a slow, unsatisfactory, and inefficient method. During our last war a box of ammunition weighed, according to the calibre, from 98 to 107 pounds. The box could only be carried on the shoulder, and was a badly shaped and heavy package, not well suited for such means of transport.

Experience in foreign armies has determined that forty-five pounds is about the maximum weight that an average man can carry for any considerable distance with ease and celerity, particularly over difficult ground. The packing box filled, now used in our Service, weighs 125 pounds, the increased weight making it a more objectionable package to carry than those we had during the war. The general total of supply among the principal nations of Europe is as follows: French, 142.5; German, 130; Austrian, 145; Italian, 138; Russian, 180 rounds, and the approved supply for a British army corps is 180 rounds per man. During the grand manœuvres in Europe, of late years, the troops have expended from 120 to 165 rounds per man in less than four hours.

There can be no doubt that had they been armed with magazine guns and had been in actual battle, the expenditure would have been much larger. Among the Turks in 1876-7 the expenditure of ammunition on certain occasions was extraordinary, reaching as high as 570 rounds per man.

As regards the number of rounds necessary to be provided per man in our Service, only inferences can be drawn, as it depends

on so many and varying conditions, but probably the supply will be greater than that provided in foreign armies, especially during the first part of the war, or until our troops become better disciplined.

It would be well, however, if the proper authorities would decide on the number of rounds to be carried in the supply trains per man, leaving it to the actual commanders to determine the number to be carried on the person.

In our Service cartridges are carried by the men in cartridge boxes, each holding 20 rounds, or in the Mills belt, holding either 45 or 50 rounds according to length; the latter is the one used for field service.

Packages (20 rounds) are, when necessary, carried in the pockets or in some way about the person. Many devices have been suggested, such as looped vests or bands with loops for holding cartridges, bags, and pouches, but none have been found satisfactory. Probably each man can carry 100 rounds on going into action without great inconvenience, but if the men are to carry about eleven pounds of ammunition the kit must be reduced in weight, for there is a limit to the load a man can carry without interfering with the proper discharge of his duty.

A package holding 20 rounds appears to be the best that can be used, taking every thing into consideration. It is not too large to be conveniently carried for short distances by the men, and no complaints are known to have been made on account of its weight or size. It cannot be increased advantageously, and to make it smaller is open to serious objections. A package holds a very convenient number of rounds for feeding machine guns, and its dimensions permit of an excellent method of packing in various ways.

It has been proposed by some to do away with the package, substituting some other means, but nothing is known to be as good for all purposes as a package.

A small number of cartridges must be united in some form to preserve the ammunition, to facilitate packing for transportation, carrying by troops on foot, as well as for use by the men and machine guns.

The present Frankford package requires some modification, as it is not arranged for feeding machine guns, and the method used for tearing the package is faulty, in that the action of the string is not always the same, and does not always produce the desired result.

A package is proposed holding twenty rounds, and consisting of a box-body and a lid—the package to be as small and light as consistent with the required strength. A broad, paper band nearly covers the package, uniting the body and lid, and securing the string in place. This forms a strong and compact package. The heads of the cartridges, when the lid is removed, protrude sufficiently to allow them to be conveniently engaged by the feeds of machine guns, and to be easily removed by hand. For packing in limbers, or pouches, or for carrying by hand, it is absolutely necessary to have the packages so arranged that the cartridges cannot fall out of the box. The string is arranged so that its action is positive, the lid being removed by one motion. Each package is marked with a large blue I. or red C., showing at a glance whether it contains rifle or carbine ammunition. These letters also indicate the manner of holding the package, for opening, which is especially important in feeding machine guns.

This proposed package is believed to be convenient for use by the infantry and cavalry, and any one understanding the feeding of machine guns will perceive its advantages.

With a view to secure greater facility in packing and unloading limbers, carts, and pack animals, as well as increased celerity in the distribution of ammunition, it is proposed to unite every ten packages into a bundle. The packages are fastened together by a string tied around them near each end, and a strong cloth band passing around the middle of the bundle. The bundle is thus well secured, and the band is so arranged that a handle is formed with which to carry the bundle when necessary, and for convenience in handling.

A man can easily and conveniently carry one of these bundles in each hand over ground impracticable for wheels, or even pack animals. He will thus transport four hundred rounds, weighing about forty-four pounds, which is very near the weight experience has shown can be carried by a man over difficult ground.

The weight of one of these bundles is not too great to prevent rapidity in loading or unloading vehicles or pack animals, and much less time is required to handle the same amount of ammunition in bundles than by single packages.

These bundles will greatly facilitate the distribution of ammunition along the lines, and prevent unnecessary waste, by having more cartridges delivered at a certain point than can be used. The present Frankford packing box holding one thousand

rounds is objectionable in some respects for use in the field, although well adapted for general transportation to a base, and in supply trains, and for storage. It is too heavy, and it cannot well be opened without tools.

That tools are required to open the box causes great inconvenience, and has frequently resulted unfortunately. It requires time and composure to dig the sealing wax out from two holes, and take out at least six long screws. It has often happened that the time could not be spared, that the screw driver could not be obtained, and the composure was wanting. Those who served during the late war, or have seen service against the Indians, well know the trouble that has resulted by having boxes thus constructed. There are times when ammunition is wanted with as little delay as possible.

When such occasions arise the boxes are opened with an axe, or any implement that happens to be convenient, or by throwing them against rocks, or trees, or against each other; but the boxes are so strong that these operations are not quickly performed or always attended with success. Not every man is powerful enough to handle one of these boxes weighing 125 pounds in a way necessary to break it apart. The strips on the ends of the boxes are frequently shattered or knocked off in transportation, and if not, they prevent the close packing of the boxes in wagons.

A packing box intended to overcome these objections has been designed. It holds 800 rounds, or forty packages, united into four bundles, and when filled will weigh less than one hundred pounds.

It can be opened easily and quickly without using any tool of any kind, yet can be securely fastened to cover risks in transportation or storage; that is, it cannot be opened unintentionally, and if opened, the fact that it has been tampered with is apparent, as it has the same protection that the present box has, viz., a seal, or seals. It is proposed to have the limbers of machine guns and the supply carts identical in every respect. The team for a limber will be four horses, and for a supply cart two. Any limber will become a supply cart by detaching the lead team, and any supply cart becomes a limber by attaching a lead team. These light, two-wheeled vehicles are of all wheeled constructions the best suited to perform the duty required of them, and they can operate over ground and under circumstances where a wagon cannot be used.

There should be as few varieties of carriages as possible. These limbers (carts) should be as simple as possible in construction, and not liable to get out of order, and should be as light as practicable. All the parts should be alike when possible, and should be constructed so that when damaged they can probably be repaired in the field. Interchangeability should be provided for, so that good limbers can, if necessary, be formed from other unserviceable ones. When machine guns are not in action, or it is considered safe to spare the limbers for sufficient time, they can be used as supply carts. This leaves the lead team with the gun, and by means of attachments provided the gun can be moved either by the lead team, by the horses of the cannoneers, or by the men by hand.

As to the efficiency and capabilities of the proposed method and the danger attending its use, let us compare it with other systems now in use. Experience derived from late wars shows that horses can be used comparatively close to the fighting lines without much loss, even now that long-range weapons of precision are used. A *bât*-horse carrying two boxes of ammunition, say 1,600 rounds, presents the same side view (target) as two horses side by side. When facing to or from the enemy, two horses present double the target presented by one, but still a small one. The target presented by the cart itself is not considered, as it can only be disabled by large fragments of shell or shrapnel, or by solid shot, which danger is not great.

Attached to one of the proposed carts (limbers) two horses can deliver (the ground being favorable) 8,800 rounds at one trip, showing that with the cart two horses can deliver 7,200 rounds more than one *bât*-horse, and 5,600 rounds more than two horses packed.

Two horses drawing a cart are no more liable to be disabled than two pack-horses. When the ground permits one of these carts can carry two boxes of ammunition in front of the chest, making a total of 8,800 rounds. This is a rather heavy load for two horses, but they have to pull it for only a short distance and return unloaded. These carts will deliver the ammunition in packages, ready for instant use, also in bundles for carrying by hand. By dispensing with the packing boxes we save the space they would occupy in the chest, also their weight. Packing boxes to hold 7,200 rounds weigh about 80 pounds, equal to about 730 rounds.

The number of rounds to be carried in the limber-chest has been determined, on due consideration of the greatest number (weight) that two horses can haul consistent with the required mobility. The chest opens on top, affording the greatest facilities for loading and unloading, and the lid, being of steel, forms, when raised, an excellent shield. Experiments prove that a steel shield $\frac{3}{8}$ of an inch in thickness, will completely stop rifle bullets at one hundred yards. The ammunition in the chest forms an excellent shield. The chest is divided into three compartments, and holds thirty-six bundles. It may be hereafter decided to dispense with the limber-chest, and use a metal frame, or rack, for holding packing boxes. Whether supply carts should be assigned to brigades or regiments must be decided by experience; it is believed that they should be under the orders of the brigade commander—in either case, they should be in charge of an officer particularly qualified for the service. The number of carts required will depend on so many and constantly varying conditions that experience and circumstances must decide how many are needed. A certain number of carts should be assigned as a reserve to each army, each corps, and each division, to supply losses, and to be used in delivering ammunition to troops and machine guns, if necessary, and as they are always filled they will form a separate line of supply. Although the supply carts are to be chiefly depended on to transport ammunition from the trains to the firing lines, it may be at times impracticable for them to do so, the ground being such that they cannot pass over it, or the fire so severe that they cannot be exposed to it. Generally, they can approach quite close to the lines by taking advantage of the ground, and all natural obstacles to the enemies' fire, or they can at least carry the ammunition a considerable distance toward the front.

To provide for this possibility (and for other uses) pouches are proposed.

The packing pouches will consist of two bags made of strong canvas connected by leather. The leather is arranged to fit the seat of the regulation cavalry saddle, and is firmly held in place by the cantle and pommel, and by attachments to the girth rings, which can be quickly attached or detached. The leather reaches to the bottom of the bags, being securely attached to the lower seam, thus forming a second (leather) back to each bag. There is no frame in the bag, and in consequence no danger exists of

damage by being brought in contact with trees or other obstacles.

At the top, each bag is fastened to the leather by means of D rings and a strap.

The bags have hoods to protect the ammunition from rain.

To use these bags the horses are detached from the cart, the pouches thrown over the saddles, the bundles are placed in the bags, and the horses led to the point of delivery; the strap is then pulled out from the D rings, and the bag revolves on the seam, where it is fastened to the leather and the bundles are turned out on to the ground without injury, as the mouth of the bag reaches to within a few inches of the ground. The bundles may be removed from the bags without causing them to revolve, but this method is necessarily slower.

To carry these pouches a horse need not be girded any tighter than for riding. When only one bag is filled the saddle should not turn. When a man mounts a horse his whole weight is thrown on the left stirrup, and one of these bags filled is not as heavy as an average man. It is not expected, however, that this will occur often, or that only one bag will remain filled, except for a very short time. By using these pouches the ammunition is delivered with great celerity, and ready for instant use; the weight of the packing boxes is saved, and any horse with a cavalry saddle on can be used. Two of these pouches are to be carried on each cart and limber.

It is possible that these pouches can be advantageously used by the cavalry for transporting ammunition. The cartridges are now carried on pack-mules, two boxes on each mule. The *aparéjo* is used, which is a large, clumsy, and heavy construction. The services of specially instructed men are required to secure the load. It takes time to load and unload, and to keep the pack properly adjusted. Twenty-two pounds of useless wood are carried in the shape of packing boxes; if one box is needed for use both have to be removed, and the load has to be lashed again.

The *aparéjo* is good for nothing except for use in packing, and the animal carrying it cannot be used for any other purpose. The empty pouches are very light and small compared with the *aparéjo*, and when not required for carrying ammunition can be placed on any horse having a saddle on, and will be found very convenient.

A canvas cover has been devised to go over the pouches in case the ammunition is to be packed for any considerable distance; it secures the load, protects it, and makes it compact. Any horse in the command can be used for packing, and only the regulation cavalry saddle is required.

One of the most difficult questions that has arisen in connection with the construction of the limber (cart) has been, whether a pole or shafts should be used.

Without entering into a discussion of the advantages and disadvantages of either, suffice it to say that the use of a pole has been decided on, it being believed that for this service at least it possesses greater advantages, and that fewer objections can be urged against it.

It is not practicable to give a detailed description of the harness proposed. It is intended to make certain improvements and overcome well-known objections to the regulation harness.

It is proposed to use a light breast harness for emergencies, to be worn by two cannoneer horses in each gun detachment. A horse, especially when ridden, can be made to do excellent work with this kind of harness. The objections to it only become manifest in continued and steady draught. It fits any horse when properly adjusted, and is much lighter than collar harness. It is not in the way of the mounted cannoneer. By using this harness the cannoneer's horses can take the place of the lead team, or can be attached in front of the leaders, or they can be used separately. By means of attachments provided, they can be used to move the gun in the absence of the other horses. This kind of harness was used with good results in Light Battery F, 2d Artillery, during the time it was stationed in Texas.

By means of the constructions mentioned it is expected that an efficient supply can be maintained under all circumstances. In brief, the proposed method is as follows:

The reserve trains—that is, the army, the corps, and the division (and the brigade, if there is one)—keep filled directly from the base, if practicable; if not, then the corps and division (brigade) trains replenish from the army-reserve train, which keeps supplied from the base. The reserve trains pack at points selected when a battle is about to take place. The corps and division trains should be located so as to be easily accessible, and as far to the front as circumstances will allow. The position of

the trains should be plainly marked, so that their location can be found without delay by the supply carts. This can be done by suitable flags; it would also be well to have all wagons carrying small-arm ammunition painted the same color, and different from that of other transportation. The troops before advancing should be supplied with all the ammunition they can well carry, for although a continued supply is most important, it is also necessary to provide each soldier with the greatest supply he can conveniently transport at the time the battle is about to commence. This can be rapidly done by the supply carts passing along the lines.

The troops being engaged, they are supplied by the carts and limbers direct from the trains, circumstances permitting. The carts returning unloaded should refill from the nearest train, and it will increase the rapidity of supply to leave the empty cart to be refilled and to change the team to another already filled; for this special means have been provided in the construction of the harness. In case the carts cannot reach the troops, the horses are detached, the pouches are put on them and filled, and they are taken to the line separately or together. In case the pack-horses cannot reach the troops, the bundles are carried by men. It seems probable that by use of these means a supply can be kept up sufficient for all circumstances. The proposed new gun-carriage will be very different from previous models, and will be provided, among other things, with a pintle-hook, so that more than one gun may be drawn by one limber. If, for example, four batteries, say forty-eight guns, lose half of their limbers, the remaining twenty-four can draw the forty-eight guns. Over good roads a team can probably haul three guns; certainly so, if assisted when necessary by the two cannoneers' horses.

In this instance the replacement of missing limbers by supply carts has been ignored, although they are intended to be so used. The gun-carriage itself will carry about 1,600 rounds of ammunition, intended as a reserve supply, only to be used for desperate work. It will also be provided with a steel shield, forming an excellent protection.

It is not supposed that any great difficulty will be experienced in supplying ammunition to machine guns in battle. For most uses to which they will be put the fire will be in spurts or deliberate, and with more actual and moral effect than that to be expected from ordinary small-arm fire.

It has been the intention in writing this article to omit the use of technical terms and expressions, and to place the subjects treated of in such a light as to be easily understood by the general reader.

The subjects are of general interest, and their importance is not confined to the Army or the National Guard.

The many thousands of men on whom would depend the defence of our country in a war of magnitude are now engaged in civil pursuits, but ready to leave their occupations whenever the country demands their services.

RECORD OF TARGET PRACTICE MADE BY LIGHT BATTERY F, 2d U. S. ARTILLERY,
WITH GATLING AND IMPROVED GARDNER MACHINE GUNS, CAL. 45".

Gun.	Distance, yds.	Size of Target, feet.	No. of Shots.	No. of Hits.	Remarks.
Improved Gardner	100	6 x 10	120	118	Cloudy, very muddy, wind strong.
" "	200	6 x 10	280	280	Cloudy, light wind.
" "	300	6 x 10	300	297	Raining, light wind.
" "	400	6 x 10	300	263	Raining, gusty.
" "	500	6 x 10	360	281	Raining hard, gusty.
" "	600	8 x 25	400	399	Clear, light wind.
" "	700	8 x 25	1,500	1,424	Cloudy, gusty, flying mist.
" "	800	8 x 25	2,500	2,416	Cloudy, gusty.
Gatling . . .	900	8 x 25	298	193	Heavy fog, light wind.
" . . .	1,000	11 x 55	2,500	1,843	Cloudy, strong wind.
" . . .	1,100	11 x 55	340	198	Raining hard, gusty.
" . . .	1,200	11 x 55	2,500	2,173	Overcast, strong wind.
" . . .	1,300	11 x 55	1,000	831	Raining hard, strong wind.
" . . .	1,400	11 x 55	1,000	768	Overcast, flying mist, light wind.
" . . .	1,500	11 x 55	1,000	692	Overcast, strong wind.

DISCUSSION.

LIEUT.-COLONEL A. R. BUFFINGTON, Ordnance Department :—From an Ordnance point of view Colonel Williston has presented the case of machine guns about as I understand it. What is proposed appears to be in the interest of simplicity. "All other things being equal, the simplest thing is the best thing, and the simplest way is the best and the easiest way of doing any thing." All ordnance *material* of whatever nature should conform to the principle involved in this trite saying. If more than one kind of machine gun be adopted, or be in service, the guns should be brought to as near a likeness as the same *carriage* for both, the same *ammunition* for both, the same method of *feeding* for both, the same *manual* or service for both, can bring them. The ammunition should not only be the same, but the same as that used in the small-arms, whether machine guns be classed as artillery or not, and the method of supplying

the ammunition on the field should be the same and the simplest possible. Remove the possibility of confusion, when every thing *is* in confusion, and it cannot take place! A uniform, efficient, and simple method of supplying ammunition would make it much easier for a commander to control the *expenditure* of it, and form a substantial basis for whatever "fire discipline" be possible. Control is directly proportional to the order reigning at the time of exercise, and *prescribed* order is easily secured when the means are few and simple, and at the same time it is made more possible under adverse conditions.

To discuss the importance of machine guns, their bearing upon future conflicts, their use in case of domestic disturbance, their employment by the National Guard and Militia, their relative value when compared with the other arms, the establishment of schools for instruction, etc., etc., would appear to be very necessary before their use is required, and to arrive at the best means for securing the most valuable results. But these things pertain more to the province of the users than to that of the constructors and direct procurers of the guns, carriages, and other material.

The basis of the system proposed by Colonel Williston is the paper packing-box. This box, as finally determined upon, may be said to be the product of many minds, simple as it is. Captain J. E. Greer, Ordnance Department, some years ago at the National Armory reported (Ordnance Notes, No. 157) upon a uniform feed for the Gatling, Lowell, and Gardner machine guns, the paper packing-box to be used directly for the purpose.

The *idea and first use* of the box in feeding machine guns must, I believe, be credited to *Mr. Taylor*, the inventor of the Taylor machine gun. The Pratt and Whitney Co., of Hartford, purchasers of his rights, made, and make, for the Gardner guns "feeding cases" essentially paper packing-boxes, although having a central partition of wood provided with a sliding top, flanged with tin, to prevent the cartridges falling out after removal of the lid, when feeding the guns. Captain Greer proposed to do away with the wood-partition device by using the Frankford or similar box, made entirely of paper, the lid of which (after having some strong attachment to the body of the box, torn away by a string or strip of linen which should also tear off one end of the lid) should perform the office of keeping the cartridges in place while feeding. This basis was worked upon at the Watervliet Arsenal and at the National Armory, until at the latter place a result was obtained deemed at the time satisfactory. Later, when necessary to definitely adopt a box, this one was improved by Colonel Williston and material changes made in the dimensions by reduction of thickness of interior partitions, etc.

The next necessary thing, for any system of transportation and supply of ammunition, is the wooden box for the paper packages. This also had received considerable attention at the Frankford Arsenal, but with no very satisfactory results prior to the device of Colonel Williston, which, having the necessary simplicity and small cost of fabrication, promises to fill the want. This box has not undergone the test of service, but it appears to have the requisites of success.

From the boxes we pass to the limbers, or supply carts and gun carriages. Here it is highly necessary to simplify as much as possible and the proposition to make the limbers and supply carts identical, with interchangeable functions; to have the gun-carriages so constructed that two or more can be moved by one limber; to have horses of gun-detachments equipped for use in moving the gun-carriages as well as having the lead horses of the limbers available for that use, must commend itself to the practical mind. In like manner the devices and methods for systematic and efficient distribution of the cartridges on the field.

I cannot do otherwise than approve the criticism of the last model of the Gatling

gun. This gun practically consists of two parts, viz. : the gun proper and the Accles feed drum, and the want of either renders the other worthless. The gun, except very slowly and with the fingers, one cartridge at a time, cannot be fed without the drum, and the drum is easily rendered unserviceable. For 104 rounds, the capacity of one drum, the rapidity of fire with this model is perhaps greater than with any other machine gun, but a break must be made in the fire after this number, to change the empty for a full drum. With cool, experienced men this change can be rapidly and easily made but the fire must cease for a longer or shorter period, and this cessation may occur at a critical moment and be fatal. With excited or with inexperienced men, a longer and consequently more fatal time may be lost in changing the drums. A continuous, though slower, fire is more desirable and effective than an interrupted one.

The drum itself must have a *machine* to fill it, unless filled more slowly—too slowly—with the fingers. Other and fatal objections are stated by Colonel Williston. For shipboard and use in scarp and counterscarp galleries and like places in which a number of drums could be kept ready charged for use, and in which the gun and drums could be surely kept in the required condition for effective use, this model is well suited, and may be called a perfect gun. But for open field work, experience, it is believed, will show it inferior to the old model with the improved feed.

It should be stated, that the improvements of the old model and the Bruce feed guide, were results of adapting the old model guns for the use of both long and short cartridges, and that the credit for these improvements is due to Mr. Bruce, certainly as much, if not more than to myself.

BVT. MAJOR-GENERAL WESLEY MERRITT, Colonel 5th Cavalry :—Colonel Williston's long study of the subject prepares one to expect a most exhaustive essay on machine guns. In this respect there is no room for disappointment. The pages, as they appear, constitute a complete text-book on the matter under consideration.

However individuals may differ with the author of the essay as to the importance of the machine gun, and the part it is in the future to perform in war, riots, and military service generally, there will be no difference of opinion as to the wisdom of every nation with claims to being considered a first-class Power equipping its army with thoroughly organized machine-gun batteries, because of the great probability of their being an essential element in an army of the future. How essential, experience alone can, in my opinion, determine.

The term "machine gun" is applied by Colonel Williston only to those of the Gatling, Gardner, and other similar types of infantry rifle-calibre, using the service small-arm cartridge, and consequently having only infantry ranges. His paper from this standpoint is admirable, having not only its own inherent value, but that, in addition, of calling attention at an opportune time to a question of importance, the discussion of which cannot but lead to results most beneficial to the Service at large. Even though the views may not in all points be adopted, the effect of the publication of this paper will doubtless lead many officers into the study of a subject with which few officers are conversant and very few are fairly informed. The organization which Colonel Williston proposes for the machine-gun service in time of war (p. 139) is one which he could hardly hope to see carried out.*

It is thought the ranges given for machine-gun fire, running up to 3,700 yards, are excessive. A knowledge at the time, of the effect of machine-gun firing, would seem to be quite as important as the same knowledge in the case of field-artillery. It is known that the Germans in 1870-71 held the French mitrailleuse in very light estimation. This may account for the incident mentioned by Colonel Reilly (p. 146) ; it

* The proposed organization has been somewhat modified since.—E. B. W.

certainly is not intended to convey the idea that Prussian horse-artillery did not touch batteries of mitrailleurs at 1,200 yards' range because they could not. However, it must be borne in mind in this connection that the mitrailleur of that date and its ammunition, were so far inferior to the American machine gun and cartridge of to-day as to be beyond ordinary means of comparison.

The great foe of the machine gun on the field of battle, is the modern rifled field-gun with its great accuracy and long shrapnel range.

The laws of battle apply to machine guns as well as to all other war machines on wheels; they will make a target for the enemy and in proportion as they become troublesome their destruction will receive more attention. A few well-directed shots from a field-battery would play havoc with men, animals, and guns in spite of the bullet-shields. It is thought that the part of Colonel Williston's paper covering the subject of machine-gun fire is less susceptible of demonstration than all else he has written on the general subject.

I agree fully with all that Colonel Williston says with regard to the *feed* for machine guns (pages 142-3-4). The drum magazine is hard to fill, is cumbersome, takes up a great deal of room for comparatively few cartridges, and gives the enemy a prominent target. Its only advantage is certainty of feed at unusually high angles of elevation; and this advantage is of small importance, as such fire would seldom be of practical use, even if some degree of accuracy could be attained with it. As it is, it has no accuracy whatever.

Colonel Williston treats the subject of small-arm ammunition supply most ably; his remarks evince close study, and are of great value aside from their connection with the machine-gun service. The adoption of magazine small-arms is certain in the near future. It will follow the breech-loader as surely as did the replacement of the smooth-bore by the rifle, the paper by the metallic cartridge, the muzzle- by the breech-loader, and, with the advent of the magazine rifle, comes the all-important question of the supply of ammunition on the field of battle.

Experts will, I think, agree with Colonel Williston in all that he says with regard to packing metallic cartridges at the arsenals of fabrication—both as to the packing-case (exterior) and the pasteboard packing (interior). The same cannot be said as to the use of the cavalry saddle as a pack for cartridges for great distances for a command on Indian campaign. Much experience convinces me that the *aparejo* is *par excellence* the means of transportation by packing, light or heavy loads, for a quick moving and long-continued expedition on the frontier or elsewhere. Sore backs and disabled animals are sure to result from any continued use, even for light loads, of the ordinary saddle or other contrivance for packing. For the distribution of cartridges on the battle-field, the pouches described, and the use of the ordinary saddle would, I think, be excellent.

Several criticisms as to the details of the paper are suggested. Is not a 12-gun battery larger than is adapted to our Service, and larger than is necessary in any Service? Should not guns have arrangements, as carriages, which could be taken where the country is not practicable for wheels? These, with other modifications, will follow if necessary, but in the meantime we must all agree that Colonel Williston has exhausted in this admirable discussion most of what can be said on the subject of machine guns.

BVT. MAJOR-GEN. HENRY J. HUNT (late Colonel 5th Artillery):—It seems strange that this subject has not been thoroughly investigated and practically disposed of in our Service. The Gatling gun, the archetype of machine guns, a new weapon of American origin, was brought to the notice of the military authorities during the Civil War, and for years after half the designated light batteries authorized by Congress

were, as shown by Colonel Williston in his excellent paper, disposable for experiment, and for the actual use of these guns in active warfare on the Indian frontier. Yet this splendid opportunity was thrown away. It is to be hoped that the discussion of the subject of machine guns by the MILITARY SERVICE INSTITUTION may now lead to such action by the War Department as will cause their definite assignment to some branch of the Army, establish their relation to the different arms, and their proper organization for service.

I have little or rather no practical knowledge of the subject, but it has always appeared to me that the character of the weapon and its many analogies, indicate the artillery as the proper arm to which to assign it. Wherever shrapnel or canister fire is useful, the machine gun would be effective as an adjunct to, or substitute for, the field-gun. The authorized light batteries furnish the necessary instruction connected with drafts and other mounted duties, for all branches of the artillery, field, siege, and machine, and this facilitates the instruction of siege trains, and machine gun or Gatling batteries. Two field-batteries are now required to keep all the lieutenants of artillery instructed, their detail running for two years. It would be well therefore to add a "Gatling" battery to each regiment of artillery, to which the lieutenants, after serving two years with a field-battery, should be transferred for a year's instruction with machine guns. If this would not supply sufficient machine guns for actual needs of the Service, another Gatling battery might be formed. This, with the two instruction batteries, would keep half the artillery force engaged in artillery instruction, and limiting the service of lieutenants in Gatling batteries to one year's instruction, would furnish room for the details of infantry, cavalry, or National Guard officers, if such details should be deemed useful as suggested by Colonel Williston. For all instruction-batteries, field, foot, or "Gatling," the captain-instructors should be carefully selected and be *permanent*. The periodical changes of captains now made is in every way injurious to all the officers and men of the batteries and companies, and for obvious reasons.

The expediency of equipping one of the sections (or platoons, as I believe they are now called in our Service) of each light battery with Gatlings, so as to make it an integral part of the battery; or of attaching a section when needed from a reserve battery of an army corps, is a question for the future, to be determined after the relations of machine guns to the different arms are established. And the same may be said as to the higher organization for army corps and divisions of these batteries and the rank of their *commandants*.

With these exceptions perhaps, Col. Williston has so fully discussed this subject and his paper is so lucid, that I find little to suggest. It is with some diffidence indeed that I present the result of my reflections—and this in a general way—on points that *must* be considered, and for this reason I will venture to call special attention to a subject which, in view of the introduction of magazine and machine guns, he justly regards as one of vital importance, *to wit*, the supply of ammunition on the field. This question was a burning one during the late war, the plague of commanders, and the source of great evils, against which it would have been easy to provide by a little organization. In the campaign of 1864, from the Rapidan to Petersburg, the allowance of infantry ammunition was increased from 100 rounds to 150. This involved an addition of near 300 wagons to the trains of the Army, which was wholly unnecessary. On its arrival before Petersburg I was informed that, after all the fighting, there was a larger surplus of ammunition *per man* than when the army left Culpeper!

Had there been but 100 rounds per man—40 on the person, 40 with the corps artillery, and 20 with the reserve artillery, from which to keep up the supply from day to day to the troops, the supply would have been ample; for comparatively small and

steady shipment from the arsenals would have replenished the general reserve. A general reserve of 20 rounds per gun for each field-gun in the Army sufficed in the last half of the war, in the Army of the Potomac, to keep all the batteries supplied. In the first years there was as much deficiency of ammunition on the battle-field, for the artillery, as for the infantry; this special *concentrated* reserve, small but applicable to every corps in the Army after a battle, cured the evil completely. This question of the supply of ammunition is one of the most important with which we will have to deal in the future, and Colonel Williston has done an excellent thing in dwelling upon it in connection with the subject of machine guns.

MAJOR-GEN. E. L. MOLINEUX (N. G. S. N. Y., late U. S. V.):—Valuable as the remarks of Col. Williston must prove to the professional soldier, they will, in my opinion, be still more useful in calling public attention to a weapon the capacity of which has never been fully tested either in regular warfare or civil commotion. To the National Guard the essay is one of peculiar interest, for the writer brings out clearly the great capabilities of the machine gun as well as the best methods of securing its advantages so as to achieve successful results in the quickest time, and consequently with the least expenditure of life and limb.

When citizen soldiers reflect that the firing capacity of many men speaks from the mouth of a single piece, and that, too, as the writer aptly observes, "without shoulders to bruise," we naturally add: "Yes! and fewer mouths to feed, bodies to clothe, and men to maintain discipline amongst and 'keep steady.'" The chief anxiety of the officer in command of untried militia during civil disturbance, arises from uncertainty whether his men will remain staunch under the trial or fraternize with the rioters.

He is constantly embarrassed by the knowledge that the bond of discipline will, to say the least, be severely tried, and the question will haunt him: Can these American citizens—soldiers for the time-being only—be absolutely depended on for unshrinking, strict obedience under fire? Nor is it, perhaps, wholly reasonable to expect it, for the experience of the Rebellion proved that "short-time volunteers," as they neared the expiration of their time of service, did not relish being placed in positions of danger when their thoughts were turned with longing anticipations towards their homes and families.

Given as example serious danger in our cities, calling the citizen-soldier suddenly from his usual avocation, with the knowledge that the next day or two would see him taking up unfinished and neglected business in his workshop, store, or office, ought not every possible assurance be given him of firm and ample support to maintain discipline in the ranks. Machine guns properly handled would do this, and, to my mind, they must and will be largely used in future by the States in sustaining the Civil Power. Indeed, I see no good reason why the police should not have them in their equipment, to be used, of course, only in the last resort as they now have the revolver, for the machine gun is simply a "magnified" revolver upon wheels. How greatly lessened would be the incentive to riot in a mob possessing the knowledge, that, failing with club and revolver, the police carried with them this element of destruction!

With the machine gun in the hands of the paid and natural guardians of the peace, there would be no delay in cases of emergency as there must inevitably be in calling for armed citizens or the National Guard. I presume, however, the same prejudice which exists against the increase of the Regular Army in proportion to the increase of population, will cry out against giving more power to the police, and, until taught another lesson by bitter experience, all we can hope for is the equipment of the National Guard with machine guns and the introduction of appropriate tactics for their use.

In his remarks on the supply of ammunition more directly in the field, the Colonel has brought his professional ability to bear upon a subject, the importance of which

has been keenly felt by almost every officer of our late Volunteer Army. How often have our anxieties been aroused on the battle-field by scarcity of ammunition ! and how frequently have the fortunes of the day depended upon an immediate supply ! In these days of rapid firing the necessity of expeditious and unfailing supply has vastly increased.

It is always a difficult undertaking to induce the powers that control destinies to consent to innovations on old systems or time-honored regulations, but I hope and believe that this essay will awaken the press and the public to a due sense of the importance of machine guns and supply of ammunition.



FIGHTING DRILL.

BY BVT.-MAJOR J. B. BABCOCK, U. S. A.,
CAPTAIN FIFTH CAVALRY.

WE are indebted to many of the participants in the battles of the recent wars in Europe, for the publication of their observations touching the actual effect of the breech-loading rifle firing upon the formations of infantry in action. We find them substantially agreed that it necessitates fighting in open order. The Germans are certainly entitled to speak with authority on this subject; and it would probably be conceded that they excel in making practical deductions from their military experience, and are prompt to profit by them in the training and drill of their soldiers.

Still we find in publications by their own officers, urgent pleas for the elimination of useless movements from the infantry tactics, and that "fighting in open order should be represented as the principal part, quite the decisive part of the action of infantry in battle, and especially open-order fighting on a large scale, the skirmishing of masses." Further, it is argued that the book of tactics, drill regulations, and the drills governed by it, should present a picture, so far as possible, of the actual conditions in action. It is held, on the other hand, that the effect is pernicious of constant practice in movements and formations, supposed to be under fire, which are impracticable in battle. The excitement produced by flying bullets and falling comrades is certainly a factor of great importance in reflections upon the probable actions of soldiers in battle, but it must be admitted that instruction on the drill-ground in the manner they should behave under fire, and in the formations they would really be called upon to make, would render the troops less liable to the sudden shock of the unexpected, when first brought into action.

Since it appears from the statements of the German officers, that up to a recent period, the actual movements of their troops in battle, and their drill regulations, failed to correspond in some important particulars, that the blood-bought experience of the fire line was not all recorded in their book of tactics, it can hardly be expected that it should have found its way into ours. It is then in no hostile spirit of criticism of our excellent system of tactics that the writer desires to call attention to the need of a more definite recognition in our official drill regulations, of the changes in the formations for attack produced by the breech-loader. Our very small Regular Army has always been chiefly useful, in anticipation of a great war, as a training school to fit officers for higher commands in the volunteer forces. It would therefore certainly be good policy to experiment upon the peace establishment with new formations, to be used under the changed conditions of modern warfare, in the hope that if the necessity again arises for the mass of the citizens to assemble under arms, the book of tactical instruction issued to their officers, would represent as nearly as possible the actual condition the troops would be called upon to face. Then at least our volunteers would have nothing to unlearn on the fire line. Certainly the study of the present infantry tactics would give the volunteer officer the impression, which he in turn would impart by the drill to his men, that the regiment would advance to the attack in line, possibly in single rank, preceded by a light cloud of skirmishers, whose duty would be "to keep it constantly covered." He would never learn from the tactics that experience with breech-loading arms teaches that the main body would really conform to the movements of the skirmish line; that the skirmish line, constantly reinforced, would be the real attack; that whole regiments and brigades would be absorbed in the dispersed line; and that, if we believe the statements of their own officers, neither French nor Germans, in 1870-71, in these open-order actions, "ever succeeded in bringing troops in close order on the line."

Fortunately for us the Upton tactics are so sound in principle, and the formations they authorize are so elastic, that they seem to possess the germs of every change that could be desired.

If we examine the actual condition of things on the fighting line, in the great skirmishing battles of recent wars, I think we

are likely to discover that our tactics need development and not radical change.

Drill the company and manœuvre the battalion beyond the fire, by the simple and rapid formations now used, but develop the skirmish-drill and make it a true picture of the modern fight.

It is true that, as before stated, a portion of the movements authorized and directed in the present tactics, seem to many to be unfitted for battles of breech-loaders, but the changes desired in formations for attack appear to flow so readily from those already authorized, that it would be unnecessary to remodel the entire book of tactics. We might, as has been done in the development of the few pages on target practice, prepare a new book, devoted to the further development of the skirmish-drill, and practical instruction of the soldier, company, and battalion, in methods of attack rendered necessary by the modern fire-arms. The addition of the two companies and the majors, so much desired, giving the infantry regiments the convenient and excellent tactical subdivisions into three battalions, would place the infantry in the enviable position of being organized and drilled on sound principles, and leave it free to study the best formations of the many at its command, for the advance of large bodies under the long-range fire of artillery and breech-loading rifles. It may then find the answers to the important questions: How to disperse the men in long, open lines and yet keep them under the control of their officers? How to reinforce the lines promptly and heavily, and yet reduce to the minimum, so far as proper formation can do so, the inevitable confusion of skirmish-lines of mixed commands when the fight attains its "highest pitch of intensity and the roar of the breech-loader is unceasing."

Our infantry can also seek to learn the best method to advance by rushes; to extend and overlap the enemy; to take advantage of the ground, and, in fact, to carry out the principles of open-order fighting of the victorious infantry of Europe, which are stated to be "to go forward but, at the same time, to make the most of its fire; to take advantage of the ground; to avoid the enemy's front; to seek his flank." All these questions and many matters of detail affecting them, are proper subjects of inquiry in the preparation of the book suggested, which, when prepared by competent officers, approved by proper authority, and issued for our instruction, should comprise the teachings of experience in recent open-order fighting, condensed in the

form of instructions and practice drills,—in fact, a manual of fighting tactics.

The Germans attribute their success in a large measure to the employment of their excellent company-column system of fighting. The company, consisting in war of five officers and two hundred and fifty-four men, is a military family bound by closest ties, under the "Company Father," as they call the captain; is elastic for drill; easily handled; and as the fighting unit, is large enough to take care of itself in many situations. It can skirmish heavily and reinforce its own line. It is a weapon of attack well equipped for independent action.

In battle, battalion movements are to a great extent abandoned for the company-column system.

With what care these companies are trained in all movements to be expected under fire, is well shown in the article by Colonel Sir Lumley Graham, Bart., republished in *Ordnance Notes*, No. 272. He says: "One result of the strong impression which the events of the last war made upon all is that the instruction of the army has become, so to say, more realistic than ever. On all occasions and everywhere you see a rehearsal of battle in all its phases." Even their target practice presents a picture of real fighting. A company takes the road in heavy marching order; marches for three hours; suddenly it encounters the enemy, indicated by a line of targets to represent the heads and breasts of men lying down along the edge of a wood or covering the crossing of a stream. The company deploys in part, opens fire. The enemy is reinforced, indicated by signal; drives in the first line. The skirmishers of the company are reinforced; the position is carried by rushes. The company moves on; meets a flank attack, indicated by targets; moves to meet it, extending and firing rapidly; again finds targets indicating artillery firing at long range, or cavalry approaching the flank; and, in fact, employs the day in fighting drill. The firing and hits on the targets showing the loss of the enemy are carefully recorded, and the skirmishing target practice is over for that time. Some English military writers have declared in favor of a smaller company—170 men with four officers. Our own tactics allow the use, if we choose to employ it, of a fighting column which is a happy mean between the two, namely, the regimental division of two companies, six officers, and 200 men.

Admitting the advantages of a united family, so to speak,

trained under the eye of the leader of the column, which the German company gives, the division system nevertheless seems to possess peculiar merits, especially for volunteer forces, and it is no doubt a settled fact that to them must be committed the honor of our arms in the event of a great war. In the first place, to properly administer the affairs of 250 or 170 men and train them for battle is beyond the power of the newly commissioned volunteer captains, zealous, active, and intelligent though they will be. Rather let them raise their companies in every township on the old model, and on the regimental drill-ground unite them in divisions for instruction in methods of attack. Again, one answer for the question, How to keep extended lines under control? is surely, more front, more officers. The German company organization of five officers on an extended front of 250 men is, therefore, not as good in that respect as the division front of 200 men with six officers, which fortunately we possess without asking for any change in the organization.

Among the most important problems to be considered in a book of tactics for the fire line are the difficulties of controlling the long front of skirmishers, and the confusion resulting from constant reinforcement of the extended lines. As before shown, the Germans look to constant practice of the individual soldier in the movements to be expected under fire for a solution of these and other difficulties. With us, as the main army has to be raised and trained after the war is upon us, it is fortunate, as an offset to the impossibility of training him in time of peace, that the American volunteer by his habit of self-reliance is excellent material for open-order fighting.

We may, however, as urged in this paper, prepare in advance the best method of meeting these evils by proper formations. Possibly, with this view, an examination here of the mode of deployment of skirmishers now authorized, may lead to the suggestion of a few changes intended to lessen the difficulty of commanding dispersed lines, and meet the evil of mixing up the different company organizations on the skirmish line before being forced to do so. We will say a battalion of four companies advancing in line, desires to throw out a heavy skirmish line of two companies, and to support them with the other two. Assume for convenience of calculation every enlisted man (two hundred men) could be deployed.

The line of skirmishers is formed. If deploying on a flank

four, the file on the extending flank of each company has travelled a distance of four hundred and ninety-five yards. The captains, eighty yards behind the centre, command each a front of that length far beyond the effective reach of his voice. The German officers say that the "roar" of the breech-loader makes even the bugle calls very difficult to distinguish. The lieutenants, thirty yards in rear, each has a front of over two hundred yards to look out for. The line is now reinforced by the other two companies. Immediately the organizations are mixed up. Company comrades are far apart, the line sways back and forth as the men make rushes or are checked. The soldier sees men on either side of him, whom he knows to be members of other organizations. He is not conscious of the presence of his company officers, and it would seem that bugle calls and commands affecting his particular company organization would soon be without significance to him.

Some of these evils could be lessened I think, by a method of deployment, which could be formed from Upton's by the addition of a few words of command and which is a good illustration of my previous statement that our tactics contain the germs of the desired changes. As an example of my meaning, we will say that the regiment is composed of three battalions of four companies each, and is advancing to the attack in line of divisions in double column of fours. This formation is not authorized by the tactics and there may be objections to its employment. For, however, the advance of large bodies of troops "formed up" as they must be at much greater distances from the enemy than heretofore, it offers the advantages of the German line of company columns and the formation from which all, or any, of the divisions may most readily be brought into line for the deployment of skirmishers. At any rate the command "Divisions, centre forward, fours left and right," the file closers standing fast, and following in rear of their respective columns of fours, is sufficient explanation of the manner in which the movement could be performed. The battalions then advancing desire to throw forward a skirmish line of two hundred men, and two hundred in support. The major of the designated battalion commands, "Divisions, right and left front into line." The line is formed in the quickest way possible. The major commands, "As skirmishers on left four *front rank* (such) company take interval, march." Both lieutenants pass to the

front and go forward with the line. The junior takes post in rear of the extended flank. The senior in rear of the centre. The front rank of the battalion deploys from single rank. Two hundred men are deployed. The front of each company extended is 245 yards, instead of 495. Each lieutenant has a front, to command, of half the former length, and the two hundred men for support of the line are left in the hands of the major, a complete battalion for working purposes, formed in *single* rank. Suppose, now, the major simply commands "Supports, post." Each half company, in single rank, takes post in support of its own skirmishers. The flank supports are ready for further extension of the line to outflank the enemy or meet an attack, in which case those companies would simply be fully extended. The line is now reinforced to full strength of the battalion. Each single-rank half company, under the captain, deploys and joins its own company comrades in front, and no companies are mixed in the skirmish line. It seems as if the fighting line, under this system, would be more controllable, that the captains coming forward, each with his own reserve well in hand, would do more to carry the line forward in rushes, by which the attack reaches its flood tide-mark, than with lines extended double the length and reinforced by some other organization.

It is readily seen that the plan suggested is open to objections, more or less important. For instance, it may be said that should the line of skirmishers advance a long distance over ground requiring the supports to be kept well back to be out of fire, the half companies in reserve are liable to take wrong directions, and find themselves in rear and in support of other organizations. Also that after the deployment of the skirmishers, should it be necessary to move the supports at once to either flank, instead of posting them at intervals along the line, the company halves would be widely separated. The first and important object of this paper is to point out the necessity for a manual of open order fighting, and instruction in the company, or division, column system of independent attack. The fate of any particular plan of deployment is of secondary importance. In defence however of the method of deployment described above, we must bear in mind, that under the present method, the line of skirmishers when reinforced is sure to be composed of mixed commands, and that the supporting companies are liable to wide separation of their component parts, if, for instance, having reinforced the

front line by a portion of their strength, they be sent to the defence of the flanks. If the nature of the ground is such that the supports can be brought up near the line, and the fight is likely to be well contested, requiring all the available fire, the shortened fronts, and manner of reinforcing skirmishers by their own company comrades, giving the captains control of their men, would appear to be a step in the right direction to discover the secret of infantry fighting, which, a German military writer says, "now consists in so regulating and controlling the independent action of the individual soldier, and of the leaders of a tactical unit, as to facilitate, as far as may be, the direction of the fight, without losing the advantages of that same independent self-reliance."

It is not intended that the present method of deployment should give place in the fighting tactics to the one suggested here. On the contrary, it is offered as an addition to the movements already authorized.

The noise produced by the rapid firing of breech-loaders is described as a "roar" not "rattle of musketry,"—a continuing, overwhelming sound.

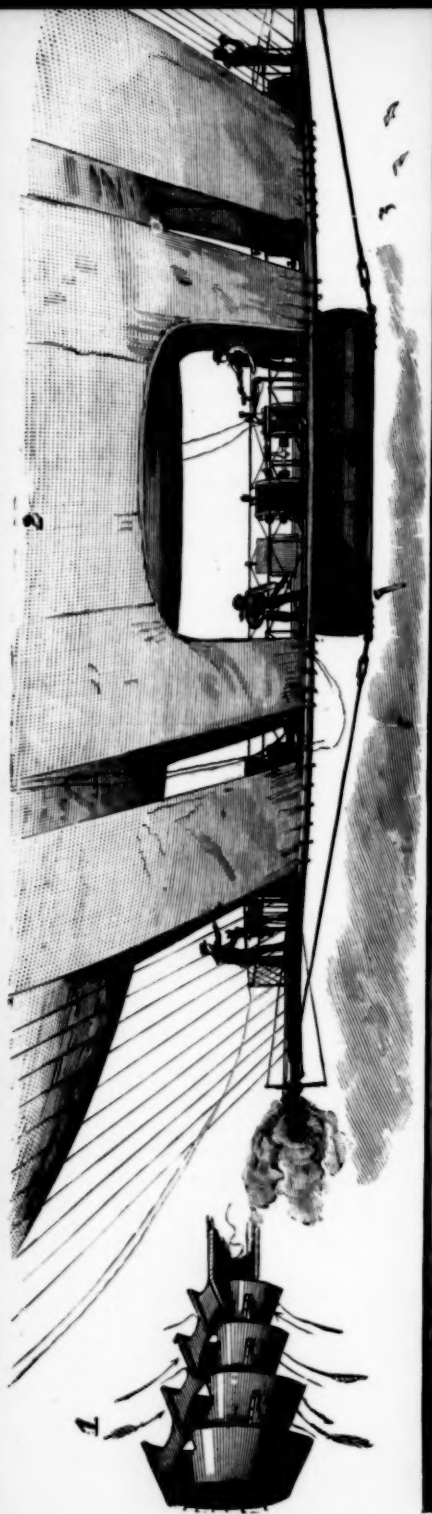
We are told that it is almost impossible to distinguish the bugle calls, but that the shrill notes of a whistle may be heard. Some of the German officers in 1870-71 availed themselves of this fact, and used whistles to signal to their men, and it was suggested after the war that all be directed to do so. The idea of using a signal whistle on the fighting line would seem to be a good one: it can be heard; the officers can use it themselves without depending on the presence of the bugler.

American ingenuity would find little difficulty in the preparation of a simple code of signals for commands. It might also be possible to introduce a few calls by which information could be conveyed along the firing front. In that case a threatened flank attack, or the occupation by any portion of an advancing line of skirmishers, of a position from which the enemy could be enveloped, might be signalled to the supports in rear. It is easy to see that in a hot fight of breech-loaders something more is required of the company leader than a gallant example. He must be as wary as an Indian chief, ready to rush forward to any fate, of course, should the necessity arise, but skilful in taking advantage of the ground for his men, and in the management of a long line of independent fighters. If the signal whistle can afford

him any aid in the performance of this difficult task, it should be considered in the preparation of fighting tactics.

It will reflect the intention of the writer, if any thing in this paper is found to be suggestive of the fact that we have much to congratulate ourselves upon in the present state of our tactics and organization, notwithstanding the plea for official recognition of the open-order system of fighting. If we desire to look further for a professional subject of congratulation we might find it in the unsurpassed equipment and "outfit" of the cavalry, the result of the experience of years of Indian warfare, and thousands of miles of frontier marching. Also, it would be well to value highly the extensive practical knowledge of campaigning so general among our officers, gained in war and in the intensely hard service of the frontier.*

* The quotations in this article are from that very interesting and instructive book, "Tactical Deductions from the War of 1870-71." Boguslauskii.





DIRIGIBLE BALLOONS FOR WAR PURPOSES.

BY GEN. RUSSELL THAYER.

TRUTH is sometimes stranger than fiction, and the novelty of a dream of a Jules Verne is realized by the actual advances of science, which in time familiarize us with those things which may have originally had their inception in the brain of a visionary.

By a curious fatality some of the most remarkable improvements in machinery and the application of the forces of nature to results which eventually have greatly benefited mankind, have originally had their first trials in connection with war and its associations, and the philanthropist delights to point to such events as confirmation of the improving destiny of the human race, which sometimes by paths the most intricate and unnatural is guided by an inscrutable power to an amelioration of its condition.

As an instance of the truth of this remark I may refer to the practical adoption of the screw propeller for general commercial purposes in connection with the propelling of ocean steamships, the first serious attempts at which were made by the government in adapting this form of propulsion to the movement of ships of war; the success of these warlike experiments gradually led to the almost universal use of this machine for purposes of peace.

Instances similar to the above may be multiplied extensively, but are unnecessary to refer to now.

It is with much diffidence that I approach the discussion of the subject indicated by the title of this paper. I am well aware of the limited knowledge bearing upon the matter which has accumulated in the past, and I know that the fear of ridicule has greatly retarded the advancement of this science, which embraces within it immense possibilities. The idea of its being made available to the wants of man has been treated as chimerical. Hulls, who proposed a steamboat in 1735, observed: "There is one great hardship lies too commonly on those who

propose to advance some new, though useful scheme. The world abounding more in censure than in a candid and unprejudiced estimation of things, if a person does not answer its expectation in every point, instead of friendly treatment for his good intentions he too often meets with ridicule."

Since these words were written by a man who foresaw the future of steamboats, what vast strides in useful science has the world made? The railway, the electric telegraph, the electric light, the telephone, and thousands of other inventions of greater or less importance bear testimony to the power of the human mind over matter.

Is the navigation of the air, by means of a balloon, as strange a thing as the holding of a conversation with a friend a thousand miles away? We are whirled over the surface of the ground sixty miles an hour, can we not move through the air at twenty?

The object of this paper is to explain how a balloon can be made to move in the air independently of the earth, the form of construction, the motive power, etc., of such an engine, its uses for war purposes, and the results which may be produced by its means in future great wars.

Let us see what has been accomplished in this matter in the past.

The balloon was practically invented on the 5th of June, 1783, by the Mongolfiers, and for one hundred years no advance was made in causing such a structure to deviate considerably from the direction of the flow of the air in which it floated. The most successful experiments in this line have only quite recently been undertaken in France at Meudon, by Captain Renard. On the 8th of November, '84, when a nine-mile breeze was blowing, Captain Renard and Mr. Krebs embarked at Meudon in their small craft for a three-quarters-of-an-hour sail. They proceeded at the rate of 14 miles an hour, gaining on the wind when dead against them at the rate of 5 miles per hour, and after sundry evolutions, to convince the most skeptical of the perfect obedience of their little balloon to its rudder, they disembarked at the exact spot from which they started.* General Hutchinson in

* This paper was read before the Military Service Institution on November 12, 1885. On November 23, 1885, Captain Renard read a paper before the French Academy of Sciences describing the Chalais-Meudon Balloon "*La France*," from which I quote the following interesting facts.

R. T.

"On the 22d of September the wind was blowing from N.N.E., that is to say,

his recent paper on the subject of "Navigable Balloons in War," from which the above statement is quoted as published in the *Army and Navy Journal* continues as follows: "Electricity was the motive power they employed, but for distant travels steam would probably be preferred, as there are few places where petroleum, or coal, or wood could not be obtained. Had they been authorized to build a 'navigable' of a large, really useful size, their difficulties in the required nicety of construction and cautiously calculated weight of every material would have been much lessened, and, calculating the value of the balloon by the number of tons it would carry, they would have effected an immense pecuniary saving." M. Gaston Tissandier in a pamphlet on "Des Ballons Dirigeables" says, at page 100, that the length should be increased as much as possible in order to minimize the resistance of the air. He speaks of lengths in the future exceeding 300, 500, and even 1,000 yards with the speed of express

from the direction of Paris, and its velocity in low regions varied between 3 and 3.5 m. (10 and 11½ feet) per second. We decided to start. This time the balloon was manned by three aeronauts: Capt. Paul Renard, in charge of measurements and various observations; Mr. Duté Poitevin, an aeronaut employed at the Chalais establishment; and myself. I did the manœuvring of the rudder and motor.

"The start occurred at a quarter past four, the weather being damp and misty. The screw was set in motion, and the balloon was headed toward Paris. At first there were a few lurches, but these I soon succeeded in overcoming, and, from this time on, despite the wind, the balloon, passing over the village of Meudon, crossed the railroad over the station at 4 h. 55 m., and reached the Seine at 5 o'clock, toward the western extremity of Billancourt Island. At this moment we measured the velocity, and found it to be exactly 6 m. (19.68 feet) per second. Meanwhile, the balloon continued its course against the wind, and approached the fortifications of Paris. At 5 h. 12 m., after a trip of 47 minutes, it entered the inclosure over bastion 65.

"The weather was becoming more and more misty, and the moist fog weighted us down and forced us to sacrifice very large quantities of ballast. Under such circumstances, it was imprudent for us to proceed farther, and so we decided to return.

"The putting about was easily effected, and, favored this time by the aerial current, the balloon approached its starting-point with surprising speed. We could no longer distinguish Chalais, as it was completely hidden by the fog, and we had to steer by taking the Billancourt bridge and Meudon station in succession as direction points.

"Eleven minutes sufficed to bring us over the landing plain, and to allow us, on our return, to pass over a space that cost us 47 minutes in going. The balloon was put about in order to keep it close to the wind, and ten minutes later the car touched the lawn from whence it had started. During this trip the balloon reached an altitude of but 400 m. (1,312 ft.).

"The following day, in the presence of General Campenon, Minister of War, and General Bressonnet, President of the Committee on Fortifications, the balloon La France made another ascension, and one that succeeded as well as that of the preceding day. The measurements of velocity were renewed, and the results of the two days

trains, and of a command over nearly every wind. Such lengths could not well be given to any not of cylindrical shape. Their great size is attended with this immense advantage, that all the weight carried need no longer be retained in one car from inadequate buoyancy. "A large 'navigable,' costing a mere trifle in commission could," General Hutchinson says, "be made far more useful and destructive to an enemy's possessions than any ironclad, yet many 'navigables' could be built at a less expense than one of those costly structures, or even of a single big gun, both likely to become obsolete in a few years. The good condition of those returned into store after severe work in Egypt, has proved that the committee had at length overcome the great bar to constant, undiminished aerial-buoyancy by having succeeded in manufacturing a light, soft coat, impermeable to hydrogen gas, which had heretofore baffled all attempts to effectually imprison it in a light envelope." This trial at found to agree. The route was just about the same as that of September 22. The wind was lighter, and carried us toward Paris. It took 17 minutes to make the trip forward, and 20 for the return. Landing was easily effected, and the balloon returned exactly to its starting-point.

"For want of ballast, the trip could not be further prolonged, the ascension of the preceding day having robbed the balloon of a portion of its ascensional force. The experiments just described have allowed me to establish upon important bases some fundamental formulas that may serve for estimating the resistance of balloons like *La France*, inclusive of netting and car. I think it well to give these here, since they differ greatly from those that it was possible to deduce from the previous, very incomplete trials, and with which I had to content myself in establishing my project.

"The resistances measured are much greater than I had believed them, and as every one else before me had.

"If we designate by R the resistance in kilogrammes of *La France* moving pointwise; by v its velocity in metres per second; by θ the work of direct traction (motive work in kilogrammetres); by T the work of the screw shaft in kilogrammetres; and by T^1 the work at the terminals of the motor in kilogrammetres, we deduce from our experiments the following formulas:

$$(1) \begin{cases} R = 1,189 v^2 \\ \theta = 1,189 v^3 \\ T = 2,300 v^3 \\ T^1 = 2,800 v^3 \end{cases}$$

"At the rate of 10 metres per second we shall have:

$$\begin{aligned} R &= 118.9 \text{ kgm.} \\ \theta &= 1,189 \text{ kilogrammetres,} \\ T &= 2,300 \quad \quad \quad (31 \text{ h. p.}) \\ T^1 &= 2,800 \quad \quad \quad \end{aligned}$$

"In a general way, we shall have for a balloon of diameter D (in metres):

$$(2) \begin{cases} R = 0.01685 D^2 v^2 \\ \theta = 0.01685 D^3 v^3 \\ T = 0.0326 D^3 v^3 \\ T^1 = 0.0397 D^3 v^3 \end{cases}$$

Meudon is about the most successful that has yet been made. The balloon which has the shape of a circular spindle was driven or rather pulled through the air by a screw placed at the bow, and actuated by a dynamo machine driven by energy imparted from a storage or more properly called secondary battery. It is unnecessary to mention the numerous systems of propulsion that have been proposed from time to time; the dirigible balloon of Captain Renard, however, at the present is the most satisfactory in its results, and, although susceptible of great improvement, practically illustrates the accomplishment of aerial navigation.

I have devised two distinct systems of dirigible balloons for war purposes which I will presently describe in detail. In the first the balloon moves in the atmosphere entirely above and without any connection with the earth. In the second the balloon is connected to the earth by means of two wires. The former system is, of course, the most useful for general war purposes, but the latter, in certain places and under certain conditions, can be utilized to great advantage. The first is an independent engine of destruction and observation, the second is most useful for transporting men and material on regular routes through the air.

It is only within recent years that the conditions of the problem of aerial navigation have been studied by engineers, competent to deal with a matter of this description, and their investigations have proved that the navigation of the air is a question, the solution of which is dependent upon the accomplishment of certain results quite within the range of applied mechanics of the present day.

By means of the device of the balloon, we are enabled to overcome the force of gravity, and to float in the atmosphere. After this discovery the solution of the problem practically resolved itself into the discovery of means for applying force for the purpose of directing a balloon properly designed in shape, on a regular course through the air in any given direction.

The extreme thinness and elasticity of the medium in which the body floats has baffled the ingenuity of the engineer and inventor in the application of a force for the propulsion of the dirigible balloon.

All methods of propulsion heretofore known have been tried and been found wanting; the idea in every instance has been to apply a surface of some resisting matter endowed with force

against the air, the object in view being to obtain thereby a reactive force that would propel the air-ship through the atmosphere. Ignorant persons have suggested wheels, oars, and similar contrivances, while accomplished engineers, as de Lome, and Giffard, and Renard, have tried to adapt the propeller to the solution of the problem. All attempts heretofore made have been to a certain extent unsatisfactory, although to Mr. Henri Giffard, the celebrated French engineer, the credit of first attempting to apply steam for the propulsion of a dirigible balloon can be given, and Capt. Renard's balloon can travel in a calm day.

Another most important point in the final solution of the problem must be here referred to, viz., that it is only within the last few years that it has become possible to construct machinery of great power and extreme lightness combined with strength. The metal aluminium is particularly useful for this description of work, and can now be manufactured cheaply and in quantities.*

Mr. Wm. Pole, F.R.S., M. Inst. C. E., in the year 1882, read a paper before the Institution of Civil Engineers of Great Britain, and discussed in a practical manner the problem of aerial navigation. The conclusions reached by him were as follows, viz.:

1. The problem of aerial navigation by balloon is one as perfectly amenable to mechanical investigation as that of aquatic navigation by floating vessels; and its successful solution involves nothing unreasonable or inconsistent with the teachings of mechanical science.

2. It has been fully established by experiment that it is possible to design and construct a balloon which shall possess the conditions necessary for aerial navigation, viz., which shall have a form of small resistance, shall be stable and easy to manage, and if driven through the air shall be capable of steering by a proper obedience to the rudder.

3. If by a power carried with the balloon, surfaces of sufficient area can be made to act against the surrounding air, the reaction will propel the balloon through the air in an opposite direction.

4. The modern invention of the screw propeller furnishes a means of applying power in this way to effect the propulsion, and the suitability and efficiency of such means have been shown by actual trial (?).

* This metal only weighs one third the weight of steel, and has much greater tensile strength.

5. Sufficient data exist to enable an approximate estimate to be made of the power necessary to propel such a balloon with any given velocity through the air.

6. The recent reduction in the weight of steam motors has rendered it possible to carry with the balloon an amount of power sufficient to produce moderately high speed, say twenty or thirty miles an hour through the air, and by taking advantage of other recent improvements, it would also be possible to carry a moderate supply of fuel and water for the working.

7. The practical difficulties in the way are only such as naturally arise in the extension of former successful trials, and such as may reasonably be expected to give way before skill and experience.

Mr. Pole's entire investigation of the subject, and the conclusions deduced, are based on the screw propeller as furnishing a practical means for the propulsion of a dirigible balloon.

A glance, however, at the tabular results reached by him, shows that as a means of applying the force generated by the steam, the propeller is unsuitable. Fancy a propeller sixty feet in diameter (the size required for a large aerial ship), and conveying a thrust of three thousand pounds; the difficulties of constructing such an arrangement that would be of sufficient lightness and strength, and at the same time manageable, are very great.

The propeller is a most suitable contrivance for the propulsion of ships in a heavy, incompressible fluid like water, especially where weight is no consideration, but is unsuited for the propulsion of bodies in an extremely attenuated and elastic medium as the air; we must seek other means to generate motion in this case.

I may here remark that the conditions which obtain in regard to a body floating in the air are similar to those which exist in the case of a ship floating in the water. In both instances the structure is supported in the medium in which it floats against the action of the force of gravity by the weight of the fluid displaced, this weight acting vertically upwards in opposition to the force of gravity acting vertically downwards through the centre of gravity; the force acting vertically upwards and sustaining the body in the fluid is called the "buoyant effort," and its intensity is equal to the weight of the fluid displaced, its line of direction passes through the centre of gravity of the displaced

fluid, and this point is called the centre of buoyancy. The following conclusions result from a thorough investigation of this branch of the subject, viz.:

1. The pressures upon the surface of a body immersed in a fluid have a single resultant, called the buoyant effort of the fluid, and this resultant is directly vertically upwards.

2. The buoyant effort is equal in intensity to the weight of the fluid displaced.

3. The line of direction of the buoyant effort passes through the centre of gravity of the displaced fluid.

4. The horizontal pressures destroy one another.

In regard to the equilibrium of the floating body, I may state that it will be stable as long as the centre of gravity of the body is below that of the displaced fluid. In the dirigible balloon that I have designed this condition will always be fulfilled, and consequently the structure cannot capsize.

Practical experiments and mathematical deductions prove that the best shape for the buoyant portion of the structure under discussion is that of a circular spindle, in which $l = 3\frac{2}{3} d$, l representing the longer or horizontal axis, and d the diameter amidships. This shape will give the least resistance to motion through the air, will comply with the conditions of stable equilibrium, and will give good steering qualities.

The ascending force of the gas, hydrogen being used, will be represented by the expression $A d^3 l$. In which d and l represent quantities as above, and A being a coefficient depending upon the shape of the vessel and on the specific gravity of the gas compared with that of the surrounding air. Supposing pure hydrogen gas to be used, the levity of 1 cubic ft. = 0.0751 lb., and with the shape above given the ascending force determined by actual experiments may be represented by the expression $.03 d^3 l$.

The resistance of the ship to motion through the air has been accurately determined by three methods, viz.:

By the midship area calculations,
 " " skin friction
 " " cubic displacement calculations;

and based upon the condition that $l = 3\frac{2}{3} d$ the following resistances have been obtained, viz.:

By the midship area, $0.000172 d^3 v^2$,
 " " skin friction, $0.000173 d^3 v^2$,
 " " cubic displacement, $0.000211 d^3 v^2$;

in which d represents as above, and v = velocity in ft. per second of time. Taking a mean of the two last expressions (the largest) the formula giving the resistance to motion forward through the atmosphere becomes $x = 0.000193 d^2 v^2$.*

THE THEORY OF ACTION OF THE AERIAL MOTOR.

To return now to the subject of the propelling force, I will observe that the idea of beating the air (a medium of extreme rarity) with a propeller in order to generate a reactive force forward is unsatisfactory, not only on account of the practical difficulties in the way, as before suggested, but also and principally by reason of the unsubstantial character of the medium upon which the force is made to act, and the great waste of power resulting from any such method. After careful investigation of the subject, I was forced to adopt the conclusion that the propelling force must reside in the motor itself, and must be applied within itself in such a manner as to promote motion forward.

This proposition may seem at first to be impossible, but the action of the motor is entirely independent of extraneous conditions, and will produce high rates of motion without applying force against any extraneous resisting medium.

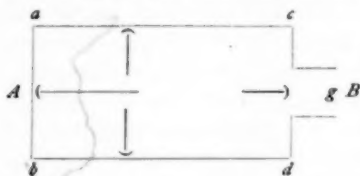
In all ordinary applications of force to produce motion, we see the force generated applied against some resisting substance. The steamboat is propelled by the reaction resulting from the action of the blades of the paddle, or screw, upon the dense medium of the water. The locomotive engine moves forward by reason of the peripheries of the drivers rolling along the rails, but the tires must grip the rail before motion results. Numerous instances of the application of force based upon the principles here involved may be enumerated.

In the case of navigating the air, however, there is nothing upon which, or against which, the force generated can be applied; we are suspended in space, between the heaven and earth, and if we except the invisible and extremely rare medium of the air, there is nothing upon which a propelling force can act, extraneous to the machine itself. Under these circumstances we can utilize the air as a medium, the weight of which causes a buoyant effort, by which we can counteract the force of gravity and float.

* Pole.

In order to move in the air, I develop forces in unstable equilibrium, acting upon the motor itself and producing a resultant force which will cause the dirigible balloon to move in the direction in which said resultant is made to act.

The principle which I have adopted to produce this condition of continuous unstable equilibrium of forces, may best be understood from the following simple demonstration :



Take a hollow cylinder, a, b, c, d , with an outlet at $g = 1$ sq. inch in area. Now suppose this cylinder is kept constantly filled with a gas air or vapor under a pressure of say 100 lbs. to each square inch. Suppose the area of each cylinder head = 10 sq. in. Under these circumstances the total pressure on the head $ab = 10 \times 100 = 1000$ lbs.; but on the head cd , there will only be 9 sq. in. upon which the force within the cylinder can act, consequently the pressure on this end of the cylinder = $9 \times 100 = 900$ lbs. All the other forces within the cylinder are in a condition of equilibrium, for the reason that they are all acting respectively in directly opposite directions, and are equal; therefore the resultant of forces = 1000 lbs. — 900 lbs. = 100 lbs. acts in the direction BA , and this will produce motion in that direction due to said resultant. The quantity of motion communicated to the entire cylinder $abcd$ in a unit of time in the direction BA can also be accurately determined by calculating the velocity and mass of the issuing energy from the outlet g in the unit of time aforesaid, and by this latter calculation it will be found to equal precisely the amount obtained by the demonstration of the resultant action of the unstable equilibrium of forces as in the first instance, the motor being regarded as in a vacuum. If in the atmosphere the resultant action will be somewhat increased by the reaction of the escaping energy upon the particles or molecules of matter composing the surrounding medium.

Upon this principle we can generate a powerful force and apply it in such a way as to produce motion with the simplest possible mechanism, and entirely independent of extraneous

conditions, and motion can be produced by this principle in a perfect vacuum.

The simplest practical method of producing and applying this force is by having cylinders filled with liquefied carbonic acid gas, and allowing it to escape out of a suitably designed outlet, provided with means for increasing the resulting action forward, as will be described. This method of propulsion would be quite effective for short distances.

The motor, however, which I have devised enables me to accumulate, produce, and apply a powerful motive force. It consists essentially of a high-speed air-compressor, coupled directly to a specially designed carbonic acid gas engine and a reservoir into which the compressed air is forced until the required pressure per square inch is obtained. The rear end of this reservoir is so arranged that, at given intervals of time, the confined energy is suddenly released, thus producing a powerful motive thrust forward. The amount of power thus rendered available is dependent upon the discharge. It is also of course a function of the time of charging, and the number of strokes of the engine made therein. By the use of the carbonic-acid gas engine we have no coal or water, which are weighty sources of energy, and we avoid all danger from fire.

Another form of motor that may be employed consists of a powerful blower drawing in air from forward, and effecting the continuous discharge of a large volume through a nozzle pointing sternwards, by this means developing a powerful continuous force acting forwards. If now a hollow truncated cone be placed over the nozzle, and the air be discharged through it, outside air is drawn in through the annular opening and mixing with the jet has velocity imparted to it. There is a loss of pressure along the inside of the cone, and a corresponding increase along the outside, which impels it forward on account of its conical form and increases the reaction of the machine; and by placing a number of these conical tubes one outside the other, and thus reducing the speed of the discharge and increasing the volume, the reaction of the several cones considerably augments that of the original jet. In experiments made with water and using five such cones as above described, it was found that the forward thrust of the motor was increased at once in the proportion of 1 to $1\frac{1}{2}$ or 50 per cent.

There are a number of torpedo boats which are propelled by

the same principle as the motor herein described, water being used instead of air. The water is generally taken up by a turbine from an opening in the bottom of the boats near the fore-part, and discharged over the stern above the water. The "Nautilus," the "Water Witch," and the Thornycroft hydraulic boat, are all propelled in the manner described, and it is important to note that the resultant action of this form of motor when used with water was proved to be the same from a given orifice and a given head, whether that orifice be above or below the water, and considering all things it was more effective when discharged above. The force produced by this motor is not true reaction as generally understood, but action induced by the discharge of matter at a high velocity in an opposite direction.

I will describe the buoyant part of the structure commonly called heretofore "the balloon," but which should properly be termed "the float." This portion of the structure is made of curved, rolled plates of aluminium one thirty-second ($\frac{1}{32}$) of an inch in thickness. The interior of the float is braced longitudinally and transversely by rods of the same metal as the shell, and is also strengthened and rendered perfectly rigid by "angle aluminiums" and T-pieces. The "float" thus constructed is quite a different machine from the ordinary gas-bag called a balloon. It is stiff and rigid and of great strength, perfectly impermeable, and compares favorably in every way with the hull of a steel steamship, and, taking into consideration the character of the fluid that it is built to navigate, is stronger in proportion than many iron ships.

A cylindrical float for a dirigible war balloon, 150 ft. long and 50 ft. in diameter with conical points 40 ft. in length, making the entire length of the structure 230 ft., and constructed, as above described, of aluminium rolled plates $\frac{1}{32}$ of an inch in thickness, will weigh about 13,188 lbs. (viz., 31,400 sq. ft. being the number of sq. ft. of surface in the float multiplied by .42 lbs., the weight of a square foot of rolled aluminium plate $\frac{1}{32}$ of an inch thick, taking the weight of the metal at 162 lbs. to the cubic foot, this being the average weight). Such a float will contain approximately 341,637 cu. ft. of pure hydrogen gas, and, allowing an ascensional force of 60 lbs. per 1,000 cu. ft., will give a lifting capacity of say $342 \times 60 = 20,520$ lbs., and $20,520$ lbs. — 13,188 lbs. = 7,332 lbs., which is the carrying capacity of the structure over and above its own weight. I consider it possible that

in the future a partial vacuum may be employed in the interior of the float to produce the necessary degree of lightness instead of using hydrogen gas for this purpose. With the rigid metal float the vacuum method possesses great advantages, but also involves some complications which may or may not be overcome; the principal difficulty being the means to be utilized to prevent the crushing of the shell of the float by the pressure of the atmosphere extraneous thereto.

I will now proceed to a description of the Dirigible-Balloon. It consists essentially of two portions: the buoyant part, which corresponds to the hull of a water ship, is made of aluminium as above described, and the shape is that of a circular spindle, in which the long horizontal axis = $3\frac{3}{4}$ times the length of the diameter amidships, or cylindrical with pointed conical ends; this structure is filled with hydrogen gas and is perfectly rigid.

It is important to observe that in a dirigible balloon the body of the *aërostat* must be at all times perfectly taut and rigid. No yielding can take place in this as in the ordinary form of balloon, and broad bands should preferably be used, to netting, to support the deck.

The deck of the ship, upon which the machinery is placed, is below the buoyant part of the structure and is firmly supported therefrom and braced thereto. Opposite the centre of the ship there is a lower deck, completely enclosed and separated from the rest of the structure in which the source of power is located. From the motor a pipe leads all or part of the energy utilized in the production of motion to the stern of the ship, and is there terminated by a nozzle fitted on a ball-and-socket joint; this arrangement permits the nozzle to be moved in any direction at pleasure, and by a movement of the nozzle from the wheel, the ship may be steered in any direction that may be desired, thus avoiding the necessity for any rudder. While the machinery is in motion and the force is being generated, the dirigible balloon is under perfect control and can be directed in any course that may be required. In the interior of the buoyant portion of the structure is placed a large silk sack connected with an air compressor on the deck, and a pipe leads from the exterior shell to the tube leading to the nozzle at the stern; both of these pipes are provided with cocks, which can be opened or shut at pleasure. There are four cylinders filled with compressed hydro-

gen on the deck of the balloon, which are connected with the interior of the exterior envelope or shell.

These appliances enable the dirigible balloon to travel at any elevation above the earth, and to ascend and descend in the atmosphere without the use of ballast. By withdrawing hydrogen from the interior of the exterior envelope and forcing air into the interior of the interior sack, the buoyancy of the structure is diminished, while its exterior form is not changed, and the structure will descend; the reverse of this operation will restore the original buoyancy and cause it to ascend. The importance of this matter will be appreciated when it is remembered that it is not proposed to travel habitually at high altitudes, but at elevations of a few hundred feet only, sufficient to clear terrestrial objects.

The following examples show the carrying capacities of dirigible balloons of various sizes, with the speed per hour and total resistances met with at the respective rates of motion; these elements are calculated from the formulas heretofore given in this paper.

In all cases d = diameter amidships, $l = 3\frac{2}{3} d$ = length.

$$d = 30'$$

$$l = 110'$$

Total ascending force = 2,970 lbs.

Resistance, 10 miles per hour, = 38.04 + lbs.

" 20 " " " = 149.11 + "

$$d = 40'$$

$$l = 147'$$

Total ascending force = 7,040 lbs.

Resistance, 10 miles per hour, = 67.62 + lbs.

" 20 " " " = 265.10 + "

$$d = 50'$$

$$l = 183'$$

Total ascending force = 13,725 lbs.

Resistance, 10 miles per hour, = 105.66 + lbs.

" 20 " " " = 414.22 + "

$$d = 75'$$

$$l = 275'$$

Total ascending force = 46,400 lbs.

Resistance, 20 miles per hour, = 931.92 + lbs.

" 40 " " " = 3,727.69 + "

$$d = 100'$$

$$l = 367'$$

Total ascending force = 110,000 lbs = 55 tons.

Resistance, 10 miles per hour, = 422.67 + lbs.

" 20 " " " = 1,656.90 + "

" 40 " " " = 6,627.63 + "

Note these resistances at the speeds specified, and observe how very small they are in comparison to the size of the dirigible balloon and its carrying capacity. It is only necessary for the

motor to develop a force equal to the resistance in any instance to produce the corresponding rate of motion through the atmosphere.

The following table shows the speed in miles, per hour, that could be commanded on any proposed course by a dirigible balloon having an independent motion through the air of 30 miles per hour, wind supposed due north, blowing with velocities varying from 0 to 50 miles per hour (Pole).

Velocity of Wind.	N.	N. N. E. or N. N. W.	N. E. or N. W.	E. N. E. or W. N. W.	E. or W.	E. S. E. or W. S. W.	S. E. or S. W.	S. S. E. or S. S. W.	S.
Calm.	30	30	30	30	30	30	30	30	30
5	25	25	26	27	29	31	34	35	35
10	20	20	22	25	28	33	37	39	40
15	15	15	17	20	25	32	39	44	45
20	10	10	13	16	22	31	41	48	50
25	5	5	7	9	17	29	43	51	55
30						22	43	56	60
35							42	59	65
40							38	63	70
45								67	75
50								70	80*

I have endeavored to describe the structure known as a "Dirigible War Balloon," and to indicate its capabilities. The uses for such machines for war purposes are various; they sail in an ocean practically miles in depth and which surrounds the entire earth; there is no place where they cannot go, harbors are unnecessary, and a large "Dirigible" could lay an entire country under tribute. In the night time, such a structure sailing slowly over a hostile fleet, army, or fort, could cause vast destruction by dropping dynamite bombs, and would practically have them at its mercy. It would also be very useful for purposes of observation.

I desire to be thoroughly understood that it is not proposed that an ordinary size "Dirigible" shall travel at high speed under all conditions of the weather, but at a rate varying from ten to twenty miles an hour under ordinarily favorable circumstances. With high winds and stormy weather the "Independent Dirigible Balloon," as at present designed, cannot cope, but there are many days, every month of the year, when it can conveniently travel in almost any direction, and its uses for war are many.

I have now described the first system of *independent* dirigible

* Pole.

war balloons and some of their uses; I will now describe the second system which was referred to, briefly, in the early part of this paper.

In this latter system the balloon is not independent but is directed on its course through the air by two wires or light cables, which are supported across the country on ordinary poles with U-shaped iron branches on their tops. This form of dirigible balloon is similar in shape and design to that previously described, but the motive power is electricity generated at the end of the line and transmitted to a dynamo machine on the deck of the balloon, through wheels which are impelled along the wires, thus moving the entire structure. The float sustains the entire weight carried, say 10 to 20 tons, and the wires which form the "balloon way" simply transmit the power to the motor, and enable the power to be directly applied for propulsion.

This form of "Dirigible Balloon" can travel at high rates of speed, under all ordinary conditions of the atmosphere. The construction of the line is very inexpensive, and it can span rivers, valleys, swamps, etc. without any intermediate supports, it can be constructed with great expedition, and would be useful in war as follows, viz.:

As it can be run where it would be impossible to build a railway, it can be constructed in a direct line across the country from one fort or town to another, and would be useful for carrying supplies, ammunition, men, and material from one place to another in a very expeditious manner. As an army advances into an enemy's country the "balloon way" can be put up in its rear, and thus establish a line of communication with the front from the base of supplies.

The "balloon way" can also be employed for forwarding to the front, at high speed, for active service on the field, the "Independent Dirigible War Balloons" which might be prevented from reaching promptly the point where their services were required by strong adverse winds or storm. Any number of them can be forwarded by this means at once to the scene of action, from whence they could be sent with ease directly over the enemy's position.

I may say that I have demonstrated by actual experiment the feasibility of both systems as described in this paper, and future wars will indicate their usefulness for other purposes than those to which I have briefly alluded.

In conclusion, permit me to recall those beautiful lines of the Poet Laureate of Great Britain, containing a prophecy in regard to the subject under discussion.

" For I dipt into the future far as human eye could see,
Saw the Vision of the World and all the wonder that would be ;
Saw the heavens fill with commerce, argosies of magic sails,
Pilots of the purple twilight, dropping down with costly bales ;
Heard the heavens fill with shouting, and there rained a ghastly dew
From the nations' airy navies grappling in the central blue ;
Far along the world-wide whisper of the south wind rushing warm,
With the standards of the peoples plunging through the thunder-storm ;
Till the war-drum throbbed no longer, and the battle-flags were furled,
In the Parliament of Man, the Federation of the World."

DISCUSSION.

THE CHAIRMAN.—*Gentlemen* : The subject is open for discussion. I have no doubt there are those here who would like to make some remarks. A Member has asked, " What uses were made of balloons in Egypt ? "

GEN. THAYER.—The balloons used there were the ordinary pear-shaped ones, and they were attached to the earth by means of ropes. They had no " dirigible " balloons ; the balloons were used for purposes of observation.

GEN. FRY.—Have dirigible balloons ever been used, practically, at all, in any war or otherwise ?

GEN. THAYER.—Dirigible balloons have not yet been used in any war. The only dirigible war-balloon now in service is that constructed by Captain Renard of the French army.

LIEUT. WHISTLER.—I would like to ask the lecturer if he has made any calculation of the amount of current that it will be necessary to carry over those wires, so as to know the amount of wire and size to use ?

GEN. THAYER.—I have made calculations sufficiently accurate to enable me to indicate the proper size for the guiding-cables of the " balloon-way " to be used.

LIEUT. WHISTLER.—May I ask what would keep it down ? The balloon would have a buoyancy which would keep it up ; would it not have a tendency to pull the poles out of the ground ?

GEN. THAYER.—Before starting, the balloon must be ballasted and adjusted so as not to produce any unnecessary strain vertically.

LIEUT. WHISTLER.—A small excess of buoyancy all the time ?

GEN. THAYER.—Yes, sir, but not sufficient to damage the lines. The motion is separate from the wire. The wires, you understand, do not move ; the pulleys move on the wire.

A MEMBER.—The leader takes hold of the wire ; the cable itself must be anchored at some point and take it up at both ends ?

GEN. THAYER.—The light cables simply serve to direct the dependent dirigible balloon on a given course, and to transmit to the dynamo motor on the deck the power generated at the end of the line.

A MEMBER.—I had the idea that the cable would be lifted.

GEN. THAYER.—So it would, slightly, in some cases, but in others it would have to be supported. When there were any valleys or rivers to cross it would do no harm to let the cables sag between the distant supports on the opposite hills.

A MEMBER.—There would be only the strength of the wire?

GEN. THAYER.—It takes comparatively little force to drive a structure such as I have described through the air. The ordinary telegraph wire would be strong enough to guide the balloon, but would hardly carry sufficient current. I would prefer a three-eighth-inch or half-inch copper cable.

A MEMBER.—Would resistance to going twenty miles an hour be very great?

GEN. THAYER.—No, on the contrary, quite small. I have referred to that in detail in the calculations given in the paper.

A MEMBER.—That would be difficult to calculate?

GEN. THAYER.—This resistance can be calculated very readily from the formula, $x = .000193 d^3 u^2$.

COL. HAMILTON.—The motion of the wind would impede, if contrary? It would be counteracted by the difference of the passing wind? It would be different from the motion that would occur in a vacuum, and that motion would occur against the medium in passing through the air, as would be the case of a torpedo going through the water, and there would be a difficulty. Would not these things be all difficult to determine?

GEN. THAYER.—If the front end of the cylinder went with the wind, then there would be more motion than if in a vacuum, and we would get motion from the surrounding medium in addition to that derived from the motor. In regard to the torpedo-boat experiments, the results obtained showed that it was practically the same whether they discharged the water below or above the water, and, indeed, when discharged in the water there was a certain amount of extra resistance, due to the friction of the nozzle in the water.

LIEUT. WHISTLER.—I have one question which I desire to advance. Perhaps my attention has not been quite close enough. I fail to get any explanation of how a side wind, with this character of balloon, would be overcome.

GEN. THAYER.—I am glad you asked that question, because I had overlooked referring to it. This portion of the balloon (illustrating) between the decks, which is below and rests on the wires, is, of course, perfectly pliable, and it enables the buoyant portion of that balloon to cant over to one side in a stiff breeze without doing any material damage. Of course with a hurricane blowing it would be difficult to stay on *terra firma*. With an ordinary breeze I do not think there would be any difficulty; it would still depend upon its grapple upon the wire.

A MEMBER.—There would be some sea-sickness?

GEN. THAYER.—There would be, naturally.

MAJOR RANDOLPH.—The balloon would have a tendency to traverse diagonally; it would be natural to have it constructed so as to turn its head towards the wind, and that would be by simply turning that around.

GEN. THAYER.—I am glad you spoke of that; I think that would be so.

GEN. CRITTENDEN.—I take great pleasure in moving a vote of thanks to General Thayer for his contribution to the Institution in this interesting lecture, and that he be requested to furnish a copy for publication in the JOURNAL.

The motion was carried unanimously.



ACROSS THE PLAINS WITH GENERAL HANCOCK.

By BVT.-CAPTAIN JAMES W. DIXON, U. S. A.,

LATE FIRST LIEUT. FOURTH ARTILLERY.

AN expedition was organized in the early spring of 1867, to operate against the hostile Indians in the geographical section known as the Department of the Missouri, and commanded by Major-General W. S. Hancock. Constant reports of unprovoked and brutal murders committed, rendered decisive action necessary, with a view to punishing the guilty parties. General Hancock wished to show the Indians within the limits of his department that the Government was able to bring to justice those who committed hostilities, and wantonly murdered travellers across the Plains, in direct violation of the stipulations of their treaties.

Those who had committed the outrages of the most aggravated nature were Sioux and Cheyennes. They had attacked the stations of the overland mail route, killed many of the employes, burned the stations, and run off the horses. They had also killed a considerable number of the settlers of the frontier of Kansas. The agents, although aware of the identity of many of the offenders, took no notice of their misdeeds. Threats were boldly made that, "as soon as the grass was up," a general war would be inaugurated along the entire frontier, especially against the main routes of travel.

General Hancock took six companies of the Thirty-seventh Infantry, and Light Battery B Fourth U. S. Artillery, together with eleven troops of the Seventh U. S. Cavalry, commanded by Lieut.-Colonel and Brevet Major-General George A. Custer, and proceeded to march from Fort Riley, Kansas, into the heart of the Indian country.

Accompanying the expedition were fifteen Delaware Indian scouts, under the celebrated chief Fall Leaf; the distinguished artist, Mr. Theodore R. Davis, as representative of *Harper's*

Weekly, and the since famous Henry M. Stanley, the great African explorer. From Fort Riley the command marched to Fort Harker, a distance of ninety miles. Halting only long enough to replenish the supplies, the column was headed towards Fort Hays. From Fort Hays to Fort Larned was but the march of a few days, and was accomplished between the 3d and the 7th of April. The agent of the Comanches and Kiowas accompanied the command to this point, and the agent of the Cheyennes, Arapahoes, and Apaches here joined it.

On the 9th of April a terrible snowstorm occurred. The cold was intense. Runners had been sent out to the chiefs of the various specified tribes, by the agents, inviting them to a council, and they had agreed to assemble on the 10th of the month. Of course the council had to be postponed.

The Sioux and Cheyennes were located on Pawnee Fork, some thirty miles above Fort Larned. They wished to avoid coming in, and also, by all the arts of Indian diplomacy, to prevent the nearer approach of the command to their "village."

On the 12th, two chiefs of the Dog Soldiers, the most blood-thirsty band of Indians of the Plains, came in and intimated that they, with their followers, desired a conference. The General gratified their desire. A large fire was built, and the officers of the command assembled around it. The Indians approached the council fire in silence, and seating themselves around it, proceeded to smoke the inevitable pipe, passing it from one to another in solemn silence, only broken by an occasional grunt. General Hancock opened the conference with a speech, which was interpreted to the Indians by "Guerrier," the half-breed interpreter. He told them why he had come among them; what he expected of them in future; that he was not there to enforce war, but to administer justice; that he regretted that more of the chiefs had not come to the council, and that he would proceed to the immediate vicinity of their village on the following day. Tall Bull, a large, fine-looking Indian, replied, but his speech contained nothing pertinent to the occasion, and referred principally to the growing scarcity of the buffalo. Accordingly, on the following morning, the command was marched up Pawnee Fork towards the Indian village. Indians were seen all day in the distance, watching the movements of the troops. They set fire to the grass, and burned it for miles between themselves and the command. On the 14th, we were met by a number of chiefs

and warriors belonging to the Sioux and Cheyenne tribes ; among them the famous chief, Pawnee Killer, of the Sioux, and White Horse, of the Cheyennes.

These chiefs remained with the command during the night. Pawnee Killer left us in the morning with the promise that he would bring in the active chiefs, but he did not return. A little later Bull Bear, a chief of the Cheyennes, came in and reported that the chiefs were on the way in for a council, but that they could not arrive for some time, being engaged in a buffalo hunt. General Hancock, who was in no degree deceived by the "diplomacy" of the Indians, informed Bull Bear that he would move his troops up the stream to meet them. The march was resumed at 11 A. M., and soon thereafter a scene was witnessed never to be forgotten by any member of that command. Suddenly there appeared upon the crest of a divide an Indian line of battle of the most imposing nature, according to the Indian art of war. It was drawn up directly across our line of march and seemed to imply, "thus far but no farther." Nearly all were mounted upon war ponies. All were in war-paint and bedecked with feathers of the brightest colors. Upon their heads they wore war-bonnets of bright crimson, and their lances bore flaming pennants. Their bows were strung and their quivers bristled with long, steel-pointed, barbed arrows. Besides these each had a breech-loading rifle and one or more large-sized Colt's revolvers. To this armament were added a tomahawk, a scalping-knife, and various other warlike weapons. About fourteen hundred Indians composed this line of battle, while as far as the eye could reach Indians could be seen watching the opposing forces. The chiefs rode madly along the line as if exhorting their braves to deeds of valor.

A finer battle-ground could not have been selected throughout the broad State of Kansas.

General Hancock, riding at the head of the column, as was his invariable custom, came suddenly upon this most imposing display. The infantry was in the advance, followed by the battery, the cavalry marching on the right flank. The General ordered the command to form line of battle, and the command was executed in less time than is required to write it, the cavalry coming into line at a gallop and drawing sabres at the word without waiting to align the ranks.

General Hancock was forbidden, by superior authority at

Washington, to strike the first blow. Innocent settlers had been murdered in vast numbers. Arms and ammunition had been sold by agents and traders to Indians in direct violation of orders, but United States soldiers must wait until first fired upon before retaliating.

General Hancock, accompanied by the members of his staff, rode forward, and through the interpreter invited the head chiefs to meet him midway between the lines.

The celebrated chief Roman Nose, bearing a white flag (the significance of which Indians totally ignore), accompanied by Bull Bear, White Horse, Gray Beard, and Medicine Wolf, of the Cheyennes, and Pawnee Killer, Tall Bear, Bad Wound, Tall Bear-that-Walks-Under-the-Ground, Left Hand, Little Bear, and Little Bull, of the Sioux, rode forward. The General inquired the meaning of the warlike display, saying that if war was their desire he was ready then and there to gratify it. Their answer was that they did not want to fight but were peacefully disposed. Upon this the General informed them that he would continue his march towards their village and encamp near it. The interview ended, the line of battle vanished almost as suddenly as it had appeared, and the troops continued the march in the direction of the village. A few miles farther on the tepees appeared in sight. Upwards of four hundred of them were erected upon the banks of the forked stream, and no more beautiful spot could have been selected in that generally barren and treeless country.

Our camp was situated some half a mile distant. At about half-past nine that night "Guerrier," the half-breed interpreter, reported that the Indians were "lighting out." General Hancock sent an aide with orders to General Custer to pursue them with the cavalry. All haste was made, but the trail spread out like a gigantic fan and the Indians escaped.

Guards were posted around the village to prevent its destruction by the soldiers. A tepee of marvellous workmanship was packed and sent to Washington. Some days later news arrived from General Custer that the Indians were murdering all the whites who came in their way, and General Hancock ordered the destruction of the village with all its contents by fire.

Had he been free to act, how many valuable lives would have been spared that were sacrificed in subsequent Indian wars, and what vast sums would have been saved to the Government !



• OUR • EXCHANGES •

THE MUSKET AS A SOCIAL FORCE.

(Reprinted by permission from the Popular Science Monthly.)

BY JOHN McELROY.

What has always greatly puzzled the historical student has been to account for the debasement of the mass of mankind that took place during the long night of the dark ages.

In the lustrous afternoon which preceded that going down of the sun of civilization for a half-score of centuries the people of Europe seemed to be enjoying a fair measure of liberty and self-respect. In decaying Rome they were poor, for the wealth had agglutinated into the hands of the few. In barbaric Germany they were poor, because the wealth had not been created. But they were all free, and highest and lowest stood on a common plane of manhood. In spite of apparent caste distances, the substance of equality was yet a permanent and controlling quality. Everywhere the high and the low were but an arm's length apart, and the arm that measured that distance was a sturdy, manly one, usually quite ready to give and return blows. South of the Alps the proudest noble was within reach of the torch and dagger of the humblest plebeian. North of the great mountains no chief was so powerful as to be beyond the spear-thrust of the meanest of his followers. No man need be wholly abject, for he was always within striking distance of his oppressor. The turbulent Roman proletariat resisted encroachment on his rights with riot and insurrection. The brawny Teuton knew no master but his elected chief, whom he deposed with scant ceremony the moment the leader's hand or nerve weakened.

A thousand years later, when day dawned once more, an amazing chasm was found to have opened up between the high and the low. The few were as gods in their power over the lives and property of the many. The low were as abject in their degradation as the beasts that perish.

In each community there had come to be one who lorded it like a wolf in a village of prairie-dogs. He dwelt on a hill-top, in a castle of massive masonry, clad himself in fine raiment, and gormandized, battered, and rioted. Where he was, there was "gude chere in knightlie hall," there were "wassail" and "revel" and "rouse" and all the other fine-named forms of the dull gluttony of feudal days.

In order that this one man might stale his palate with dainties, thousands of other men—"serfs," "churls," "villeins," "hinds," "peasants," etc.—were deprived of all but the smallest amount of coarse food that would enable them to live, labor, and

reproduce their kind ! In order that he might clothe himself in piled velvet, and his lady "walk in silk attire," they and their wives were confined to a single coarse garment. In order that he might sleep on down in marble halls, they were restricted to a couch of rushes in a fireless and windowless hovel.

Now, how did this man on the hill-top "so get the start of the majestic world" that all the kernels and sweetmeats in the lives of thousands were his, while only the rinds, the husks, and the shells, were thrown to them ?

The answer is easy : It came about through the adaptation of the horse to warfare, and the development of defensive armor. Improvements in armor made the aggressive, domineering man invulnerable to spear and dagger in the hands of those whom he would oppress. Enconced in tempered steel, and moved by a horse's mighty motive power, he was irresistible to those who could only oppose to him their own unprotected thews and sinews.

It is significant to notice how constantly the idea of the horse is associated with the elevation of the few and the degradation of the many under feudalism. In all the tongues of Europe it is the "Man on Horseback" who is the lord and despoiler of the people. The Germans called him "Der Ritter" (the rider), and cognate words designated him in all the divisions of the Teutonic speech. In French the horse is *un cheval*, and the tyrant of fields and people a *chevalier*. The Portuguese called him a *cavallero*, the Spaniards a *caballero*, and the Italians a *cavaliere*—all direct derivatives of the Greek and Latin *caballus*, a horse. In England, where, for reasons that shall be given presently, the people were not crushed down to any thing like the extent of their class on the Continent, the name given the Man on Horseback shows that he never acquired any such arrogant supremacy. There he was merely a knight (Anglo-Saxon *cniht*, a youth, an attendant, a military follower).

In the far-off days, ere the centuries had entered their teens, the gentleman who was burning with enthusiasm to earn his bread by the sweat of some one else's brows proceeded differently from what he would now. Contrasted with the neat finish of an "operation" in stocks or produce, or the Louisiana Lottery, his methods seem crude and clumsy. Nevertheless, like the methods of most of the processes of primitive people, they were quite effective.

He provided himself with a stout horse and a suit of armor combining all the latest improvements. He then set himself up as the lord and "protector" of as large a collection of land-tillers as he could cajole or force into accepting his "protection." Sydney Smith wittily described a lawyer as "a gentleman who rescues your estate from your enemy and keeps it himself." It was on this principle that these "protectors" acted. They took the entire product of the husbandman's labor as a reward for their friendship and courage in protecting him from spoliation by some one else !

The period was the Golden Age of Might. It was the day of the absolute monarchy of Brawn, and the strong right arm was the court of first resort and tribunal of final appeal. Centuries of Egyptian, Greek, and Roman civilization had developed the science of jurisprudence into laws and customs which were fairly equitable in securing ownership of person and property. But moral chaos came again when the Gothic cataclysm rolled over Europe. There was no longer any recognition of a man's right to any thing to which he could not hold on by main strength.

The gentleman whose factory-plant, office-furniture, and stock in trade consisted of a stone castle, a broad-haunched horse, a business-suit of spring-steel, and a twenty-foot lance, held thirteen trumps in the game as it was then played. To propitiate him—to gain even the privilege of living in unutterable wretchedness and squalor—freemen surrendered their lands to him, gave up all their labor's products, and even yielded to him such of their women as his momentary caprice might demand.

The Men on Horseback divided all the arable lands of Europe among them. Naturally they had hot disagreements as to who should have the monopoly of plundering a given valley or plain, and carried on the dispute with much clamor and fighting. In spite of the ornate descriptions of romancers and ballad-singers, this latter was not of a very sanguinary nature. So completely was armor finally made to answer its intended purpose, that there are records of "battles" between imposing arrays of armored horsemen, which lasted all day, but in which not a single life was lost. The worst likely to happen to any combatant was that he be unhorsed, pinned to the ground by the weight of his armor, taken captive, and forced to pay ransom. "The knights of old" were warriors "for revenue only."

The only likelihood of any considerable slaughter was when the wretched serfs—goaded to madness by their wrongs—revolted against their despoilers, and strove against them with pikes, scythes, bills, and similar ineffective weapons. Then the wolf-hounds of murder were let loose. Cavaliers at war with one another would make a truce, to join in slaying "rebellious hinds." The last great battle of this kind was in the "War of the Jacquerie," in 1348, where nine thousand poor serfs were massacred in the French town of Meaux, and in the three weeks that the hunt lasted more than twenty thousand were slain. So fond were the chevaliers of this sport of hind-killing, that it was not an uncommon thing for them—before or after one of the great armor-battering matches which they called battles—to turn upon and slaughter the poor wretches whom they had mustered to attend them to the field. King Philip of France opened the battle of Crécy, in 1314, by charging his Genoese cross-bowmen with his chevaliers, and slaughtering them right and left!

The only men who resisted successfully these mounted ravagers and maintained for themselves some of the rudimentary rights of humanity were the merchants and artisans in the walled cities of Italy and Flanders; the Swiss, in their mountain fastnesses; and the insular English, whose dreadful long-bows would send arrows a cloth-yard in length through the best Milanese plate-armor. In consequence of the excellence of the English archery the Man on Horseback threw there so poorly that the worst condition of the English people in the Middle Ages was always better than the best condition of those on the Continent. Nor could the Man on Horseback's charge avail against the Italian and Flemish burghers, behind their solid walls.

In 1386 a horde of Austrian cavaliers, who were striving to reduce the Swiss mountaineers to serfdom, penetrated some distance into the Canton of Unterwalden. The ground was so rugged that they had to dismount and proceed on foot. They were compelled to cut off the long toes of their shoes in order to be able to walk. They were suddenly confronted at Sempach by a small band of determined peasants. Arnold Struth von Winkelried performed his immortal act of self-sacrifice, by breaking with his naked breast the firm front of lances, and his companions rushed in and slew the clumsy dismounted horsemen. This and similar victories secured the freedom of the dwellers among the Alps, and bred there a race of men who were to become the flails to help beat feudalism to fragments.

With these exceptions the print of the war-horse's hoof was on every fertile acre in Europe. The long lance of his rider reaped the sickle which reaped the fruit of every man's labor. Greedier and greedier every year grew the hungry horde of steel-clad riders. Less and less of the comforts of life they left the abject peasantry. Nearer and nearer the condition of the laboring cattle sank those who delved and planted, and reaped and garnered.

The horsed harpies knew themselves well. They delighted in the character of birds and beasts of prey, and were proud to make lions, tigers, bears, eagles, and hawks, the cognizances by which they were known.

The sole mitigation of this reign of misery for the many was that, in spite of their armor, these rapacious harriers occasionally devoured one another. The strongest slew the less strong; the lions killed off some of the hyenas and jackals; the eagles tore to pieces the kites and hawks. The strongest and craftiest lord of some single hill-top killed off a number of his associates in the robbery business, or seized their lands after they had drunk and gorged themselves into the grave, and became lord of all the hill-tops commanding the entire plain or valley—became a prince, duke, count, or marquis. The same process welded several of these principalities, counties, dukedoms or marquisates into a kingdom. The advantage to the people of this was, that they had fewer masters to feed and clothe, and the exactions upon them had somewhat more system. Spain and France became the leading nations of Europe because this process of aggregation went on more rapidly there than in Germany, Italy, Austria, and elsewhere.

Progressive people, everywhere, saw clearly what an improvement a king was upon the Man on Horseback, and became his advocates and supporters.

If, however, there had been no brighter hope for mankind than was contained in the evolution from a swarm of petty tyrants to a monarch, the outlook would have been dark indeed. A millennium of that kind of progress would scarcely have brought mankind up to the plane occupied by the Russian serf to-day. Fortunately, another force was born into the world. Whether "black Barthel," the German Monk, discovered gunpowder, or whether Friar Bacon preceded him, is of little consequence. The fourteenth century was yet quite young when *somebody* found out that a mixture of sulphur, nitre, and charcoal would deliver a very heavy blow, and, as it was a day when heavy blows commanded the highest price of any thing in the market, the attention of all progressive men was quickly turned to it. If we except the rhythmic beat of the vibrating battering-ram, the sturdiest blow then known was that which the momentum of a galloping horse delivered at the point of a lance. But even with the first rude tubes of wood and leather, or hooped iron boxes, the new force struck a blow that dismounted the doughtiest cavalier, and breached the thickest walls.

It began its work for mankind as the slave of kingcraft. Only kings could afford the costly "mortars," "vases," "culverins," "perriers," "falcons," etc.—only monarchs could employ the skilled artisans who manipulated these

" . . . mortal engines whose rude throats
Th' immortal Jove's dread thunders counterfeit."

It had to serve an apprenticeship to autocracy before it became democracy's mighty minister. It prepared the way for its future mission, even then, for kings used it to dismount cavaliers, and beat down their castle-walls. The despotism of the Man on Horseback began to crack around the edges, and in the rifts and fissures of the iron tyranny fell the mustard-seed that was to grow up into the world-shadowing tree of liberty. Its development was dishearteningly slow, however. It was a day when all intellectual processes were as slow as the pace of the overladen battle-horses, and invention crawled languidly, instead of running and leaping, as to-day.

So it was fully a century and a half after Ferdinand IV. used the first cannon to aid in capturing Gibraltar, before we find a Man on Foot using the first crude attempt at a musket. A favorite type of cannon were then called "bombards," and he styled this diminutive copy a "bombardelle." Nothing could have been ruder and more primitive in design and construction. It was merely a tube—probably about as large as a section of two-inch gaspipe, but not so well made—with one end closed, and near that a small hole for a vent. It was securely fastened to a stout stick, the end of which rested on the ground to receive the recoil. The Man on Foot, clad in light

armor, held the bombardelle up, while a comrade touched a live coal to the vent. Powder was as yet very weak, and it was necessary to use a ball weighing about a pound, in order to do any execution, even at the range of a few score paces. Nothing illustrates so well the amazing slowness of the evolutions of the heavily armored men and horses as that this clumsy weapon, which probably never had an effective range of one hundred yards, and could not have been fired oftener than once in five minutes, could have rendered any service whatever. With no facilities for aiming, it was by the merest accident that it struck the cavalier, unhorsed him, and put him at the mercy of his enemies on the ground, but even this chance was much gained.

The power was now getting into the hands in which it belonged. Invincible infantry means democracy sooner or later, just as inevitably as the invincible Man on Horseback meant aristocracy, and artillery autocracy. The foot-soldier, even though he be the myrmidon of a king or the henchman of a lord, is, unconsciously perhaps, the enemy of noble and sovereign. He comes from the people and returns to the people. Whatever he may do at behest of liege or lord is an object-lesson to his fellow-commoners as to what they may do in opposition. Every step taken by his masters to make him more formidable is

" Bloody instruction, which, being taught, returns
To plague th' inventor."

The first cavalier that was rolled in the dust by a bombardelle-ball reopened the era of the people which had closed when Rome's matchless infantry disappeared from the fighting world. Thenceforward the final overthrow of feudal and kingly despotism and the triumph of the people became merely a question of improvements in the bombardelle. In vain the Man on Horseback strengthened his armor and thickened his castle-walls. The stronger his armor, the more he was weighted down; the slower he moved, the longer he was within striking distance of the man with the "hand-gonne." Nor could the thickening of his walls keep pace with the improvement in cannon-making, the substitution of iron balls for stones, and the strengthening of gun-powder.

In those days the Germans called cannon "boxes" (Büchse), from the manner in which they were built up. They devised a fork or hook (Haken) to support the bombardelle and afford better aim, and called the improved arm a "hook-box" (Haken-büchse), whence the various forms of "harkebus" and "arquebuse" in the different languages. Presently the tube, growing still lighter as the improvement in the manufacture of powder enabled the weight of the ball to be continuously reduced, was laid in a stock similar to that of the famous Genoese cross-bow, and a priming-pan was placed at the vent. A little later a still more valuable improvement was made by attaching to the rear end of the barrel a piece of iron shaped like the letter S, and called a "serpent." The upper end of this carried the tip of a lighted rope-match into the priming-pan when the lower end was moved by the finger. When a trigger and springs were subsequently added, the Man on Foot had the historic "matchlock," with which he fought for two and a half centuries.

Thenceforward the march of improvement was steady and at an accelerating pace. The "hand-gonne" gained continual access of power over the Man on Horseback, and as continually its use became more familiar to the people at large. By singular concatenations, which some people are fond of terming "providential dispensations," the men advocating the best ideas got hold of the best improved guns and had the most of them.

In 1477 the Swiss, who had grown so self-confident that they did not hesitate to descend from their mountains to attack the Men on Horseback on the plains, came

down from the passes of the Vosges Mountains carrying from six thousand to ten thousand of these fire-locks, and at Granson, Morat, and Nancy, literally destroyed off the face of the earth the arrogant Charles the Bold and his rapacious Burgundian chivalry. Guns which combined the improvements of another half-century enabled the Spanish footmen to smite the French chevaliers hip and thigh at Pavia in 1525, where Francis I. "lost every thing but honor," and the Spanish infantry became the first in Europe ; a position it held for nearly a century, until, as the instrument of ecclesiastical tyranny in the Netherlands, it was defeated by the superior guns and tactics of the Dutch infantry under Maurice of Nassau.

A few decades later the use of paper cartridges by the Swedish musketeers gave them an advantage which greatly aided Gustavus Adolphus to widen the horizon of Liberty by his successful warfare against the hordes of civil and religious despotism. Nearly simultaneously firelocks, in the hands of Cromwell's superb foot-soldiery, were preaching irresistible arguments on the Rights of Man to Charles I.'s cavaliers.

The mediæval Man on Horseback may now be said to have permanently disappeared from the field of battle. Granson, Morat, and Pavia had showed him of how little avail it was for him to cover every inch of his own body and that of his horse with the best steel, and he began stripping it off, to gain celerity of movement under the dreadful fire. By the end of the seventeenth century it was all gone but the helmet and breastplate, and these were not worn by him, but by his mercenaries. As the musket now enabled battles to be determined by the superior manhood of superior numbers, and there was always a great deal of downright killing, he lost his keen interest in war as a business, and loved best to fight by proxy. The plaint of the fop to Harry Hotspur was an anachronism of about two hundred years for Henry IV.'s reign, but it expressed pretty accurately the feelings of the aristocracy in Shakespeare's time :

" And that it was a great pity, so it was,
This villainous saltpetre should be digged
Out of the bowels of the harmless earth,
Which many a good tall fellow had destroyed
So cowardly ; and but for these vile guns
He would himself have been a soldier."

The Man on Horseback still continued to don his suit of "complete steel" from time to time for nearly a century after it was last worn in line of battle, but it was only to impress the popular imagination and enhance his personal appearance when he took part in the pageantry of government. The long warfare between him and the king had ended in his entire subjugation, and he was now an obsequious attendant upon "his royal master," with whom he had entered into an offensive and defensive alliance against the common people.

Steady improvement of the weapon through the seventeenth and eighteenth centuries, by the men who were wielding it to gain for themselves the commonest rights of ownership in their own souls and bodies and the fruits of their toil, had made the musket so handy that the cumbrous fork-rest could be dispensed with, and had given it the flint-lock, the bayonet, and the front-sight, which latter greatly increased the accuracy of aim.

By another of those remarkable providential dispensations, grim old Leopold of Dessau devised the iron ramrod, just at the time when it was most needed to enable the little Prussian army to withstand the overwhelming masses of barbaric Russia, stupid old Austria, and intriguing France. As Frederick's II.'s men were able to fire five times to their enemies' twice, the reactionary waves beat in vain against the new bulwark raised up to protect the progressivism which had made its home in North-western Europe.

Across the Western seas a still greater development was taking place. In the grasp of the men who had sought refuge from tyranny, in the wilds of America, the musket was not the mysterious and awkwardly handled engine it was in the hands of most Europeans. To the colonist it was the most familiar of his every-day tools. The daily food of the family was provided with it; the fiercest wild beasts were slain by it, and the fiercer wild Indians were conquered by it and driven from the lands which they claimed as their birthright. Being its owner's main dependence in his struggle for life, he naturally strove to raise its powers to the highest mechanical limits of the day. By rifling the inside of the barrel, and placing a sight on the rear end, he made his aim mathematically certain. With such a weapon he could encounter every mortal foe with entire confidence. Rattlesnake nor panther, wild Indian nor foreign mercenary, had any terrors for him. If his foe had brain or heart, his unerring bullet was sure to find it.

With his rifle in hand the common man reclothed himself with all the rights that had been torn from him by a thousand years of the despotism of the Man on Horseback. He brooked so little of tyranny that he would not endure so much of it as was involved in the attempt to tax him without his full consent. The assertion in the preamble to the Declaration of Independence differed from most similar fulminations in that it was not ahead, but only abreast, of the popular acceptance of the principles which it affirmed. Men were not only endowed with the inalienable rights of life, liberty, and the pursuit of happiness, but on this side of the ocean they exercised them to the fullest extent.

Still more: they taught the Frenchmen who had come here to assist them in their final struggle for freedom, by precept, and those who had stayed at home, by example, that the musket was the means by which those rights were obtained and maintained. They demonstrated in practice the axioms to a perception of which all Europe had been slowly rising: that before the musket's muzzle all men are equal; that lordly lineage, boundless wealth, nor privileged caste can hedge a man with a divinity impervious to bullets; but that any set of men, who love liberty well enough to peril life for it, must be met on equal terms, with equal hazard of life, by those who would deprive them of it; that the reign of the few was ending, and that of the many beginning, for, with all men equally able to kill their opposers, only those governments and systems of governments can maintain themselves which can rally to their support more than can be arrayed in opposition.

In all the world's history no teaching ever had such immediate and tremendous results. Within a quarter of a century after the close of the American Revolution the new Evangel of Freedom had flamed from the Seine to the Moskwa, at the muzzles of millions of muskets, borne by men who had suddenly risen from the abasement of serfdom to the full stature of manhood. In France, the chosen home of chivalry, the degenerate sons of the Men on Horseback had been drowned in a sea of their own vicious blood. In all the fairest parts of Continental Europe the land had been wrested from the heirs of the banditti-lords, and restored to the ownership of those who tilled it. The whole civilized world had begun that rapid march toward popular government

" . . . whose compulsive course
Ne'er knows retiring ebb,"

but will "keep due on," until emperors, kings, and potentates will be as obsolete as the "tabards," "beevors," "brassards," and other trumpery of the mediæval Man on Horseback.

All life is battling—all society a conflict of forces. Little worth having is ever got without being wrung from the teeth of opposition. Particularly is this true of the ordi-

nary possession of manhood. Every privilege and immunity which we enjoy to-day, without more thought than we enjoy the sunshine and the summer air, has been extorted—most frequently through bloodshed—from those who would fain withhold it. The student of history reading the Bill of Rights sees in every clause the result of some successful war fought to wring a concession of that particular principle from the dominant class. The musket has steadily led the way and supported every extension of the boundaries of freedom. Without so irresistible a weapon within reach of every man's hand, the world would still be prostrate under the hoofs of an equestrian aristocracy, whose despotism would only be tempered by the tyranny of kingcraft.

Artillery is monarchic, cavalry aristocratic, and infantry democratic. Armor and the horse brought about the rule of the few over the many; cannon helped make one man ruler over all; while the musket is the agent of the popular will and the pioneer of universal suffrage. "All free government," says an eminent philosopher, "depends upon the power of the majority to whip the minority." The fundamental principle of democracy is that the wishes of one thousand men shall prevail over those of nine hundred men, and the musket gives the thousand men the physical power to enforce their will upon the nine hundred men.





• CORRESPONDENCE •

I.

WOOD POWDER.

From a Foreign Correspondent of Council.

ANTWERP, Feb. 6, 1886.

Dynamite, long used as an explosive in the Engineer Corps of the Belgian army, has lately, on account of the numerous difficulties attending its use, been replaced by *wood powder*, made at Canbille (?) near Peer in the province of Limburg.

The powder is simply sawdust, treated with a mixture of nitric and sulphuric acids, and afterwards formed under powerful pressure into cylindrical or prismatic cartridges.

These cartridges are prepared for commercial use by covering them with paraffined paper, which protects them from moisture. A cylindrical opening intended to receive the Nobel primer is covered with a disc of paper also paraffined, which can be torn off with the nail when the cartridge is to be fired.

Wood powder is denser than dynamite with cellulose containing 75 per cent. of nitro-glycerine, it contains from 2 to 2½ per cent. of water, and in its normal state it detonates less easily from a shock. When very thoroughly dried its sensitiveness increases as well as its explosive power. It has the appearance of gun-cotton; it is hard; does not lose its shape and does not exude. It can be separated into portions easily by grooving its surface with the point of a knife and pressing against the sides of the groove.

As paraffine paper protects wood powder for five or six hours when it is plunged into water, it is practicable when blasting with it to employ cylindrical cartridges and use water for tamping them.

To rupture hard bodies such as rails, palisades, etc., prismatic cartridges in contact with the body, are preferable.

It should be remarked that in an unconfined space there is an advantage in provoking inflammation of the explosives on a point opposite to the surface of contact with the body to be ruptured.

The instantaneous production of the gases arising from the primer and the explosive, and the simultaneous action of these gases in every direction, cause the air



in contact with the face surface of the cartridges to act to some extent as a light tamping, and the power of the explosion is directed to the other face.*

EXPERIMENTS.

The formulæ used to determine the minimum limit of the charge are :

$C_g = 5 \text{ Scq}$ for fracturing a rail.

$C_g = 10 \text{ Scq}$ for the rupture of a double-T wrought-iron beam.

C_g , represents the charge in grammes.

Scq represents a right section of the body to be ruptured, in square centimetres.

The cartridges are put up in charges of 100 or 150 grammes, and in the field the weight of charge indicated by the above formulæ would be changed a little in order to employ a number of entire cartridges.

In comparative experiments made upon a rail with wood powder and dynamite with cellulose, it was ascertained that for equal weights charges of the first substance were at least as powerful as those of the second, and that the results were more constant, more regular.

In the experiments for rupturing double-T beams, the maximum effects were produced when the cartridges were placed in the angles upon one face of the beam.

Below are the results of the different experiments in the rupture of double-T beams of wrought iron, with equal weights of wood powder, of dynamite with cellulose, of gun-cotton, and of paleine of forty per cent :

Nature of Explosive.	Price per Kilo.	Number of Trials.	Complete Rupture.	Sufficient Rupture.	Insuffic'nt Rupture.	Failed to Explode.
	(Francs)					
Wood powder	3.50	10	8	2		
Dynamite with cellulose	4.50	8	4	1	3	
Gun-cotton	5.00	5	1		3	1
Paleine	6.25	6	3	2	1	

But it is especially with reference to transportation with an army that wood powder possesses remarkable advantages. It is well known what precautions are essential in order to protect dynamite cartridges in pack-trains from projectiles which might strike them and cause explosion. With cartridges of wood powder this danger need not be feared, since when they are placed against iron plates and struck by bullets fired at a distance of fifty metres, they do not explode.

Compared, then, with the explosives cited above, wood powder presents the following advantages :

- 1st. Its destructive power is sensibly superior.
- 2d. Its effects are more constant, more regular.
- 3d. Its fabrication is simpler, and does not offer the dangers inherent in the preparation of nitro-glycerine.
- 4th. It is but little sensitive to shock.
- 5th. It does not freeze, while dynamite freezes at 8°C . (or above zero), and must be thawed out for use—a very dangerous operation.
- 6th. It does not exude like the dynamites, which diminishes the danger of accidental explosion.

* Experiment proves this very conclusively ; with a torpedo it is of great advantage to have the point of inflammation below, if the object to be destroyed is above, or at the base of the cone if it be an automatic torpedo or in case of a shell.

7th. Its contact with the hands does not poison, whilst the dynamites cause, by their absorption through the skin, very serious troubles.

8th. It is very readily used, as each cartridge has a hole for the primer, and special priming cartridges are not necessary, as with gun-cotton.

9th. Perfect contact between the different portions of wood powder is not necessary for the complete explosion of the whole charge, whilst it is indispensable for gun-cotton.

10th. It is cheaper than the above-mentioned explosives.

11th. It may be kept in damp magazines without deterioration.

12th. It is safely and easily transported, and a soldier can, without danger, carry a cartridge of wood-powder in his pocket.

P. HENKARD,
Colonel 5th Regiment, Artillery.

II.

AN EAST-INDIAN REVIEW.

From an Occasional Correspondent of Council.

HEAD-QUARTERS OF GENERAL SIR FREDERICK ROBERTS, NEAR DELHI, }
January 20, 1886. }

I came to this camp on the 15th instant, where, thanks to "The Chief" and his military secretary, Col. Pole-Carew of the Coldstreams, I was furnished with a most comfortable tent, and also one of the "A" pattern for my servant, the latter somewhat larger than that used in our Service—say, about twelve by fifteen feet, a little higher, and with a small wall of eighteen inches, and lined with yellow cotton cloth. I am thus particular, as it is the identical field-tent used by the enlisted men of the Indian army.

Usually in hot weather this has the addition of a "fly," which gives an air-space between it and the body of the tent and adds to its coolness. The slight wall when raised admits the passage of a current of air. The cavalry use a similar tent, but about double the depth, and intended for a greater number of men.

As for my own canvas home, it is almost palatial. Imagine two conical-roofed tents with square walls, one within the other and supported by a single pole through the centre, the interior space being about twenty-four feet square, walls some six and a half to seven feet high, the outer tent walls somewhat higher and separated from the inner by a space of three feet. Each tent has four doors, which roll up, and an additional protection of a green blind made of light bamboo; both inner and outer tents being lined with colored cotton cloth, generally of yellow ground and agreeable to the eyes.

The accredited foreign officers have still larger tents, mostly hipped roofs, provided with fire-places and divided by canvas partitions, their fronts and approaches to the entrances made bright and cheerful by pots of tropical plants. In truth, every thing has been done to render their visit agreeable, and no pains spared to enable them to have a thorough insight of the material, organization, and inner working of the Indian army.

During the manœuvres they were provided with a flying camp, where every reasonable comfort was arranged. In truth, I believe they had a dinner party nearly every night while in the field.

Before dismissing the subject of tents, I wish to note some of the still larger—as, for instance, the reception- and dining-tents of the commander-in-chief. In the former, at an evening party in honor of the Viceroy, Earl Dufferin, I saw some two hundred

guests, and have dined with General Roberts when there were at least forty at table. The head-quarters mess tent, which was at my service, could dine readily forty-five. English officers make a good deal of their mess, and rarely dine, save in the prescribed uniform, which is a mess-jacket, rather elaborately embroidered, and a vest that is richly decorated.

But to return to the rank and file of the Service. The native troops struck me, and I believe our accredited officers are equally impressed, as being far in advance of what was looked for, the Ghoorkas and Sikhs being especially noticeable—the latter from their good height, fine physique, intelligence, and general fondness for the Service. They were among the last of the native tribes to yield to British rule, but have ever since been the most loyal of Her Majesty's Indian subjects. They were thoroughly devoted during the mutiny of 1857, and did good service against the rebels. Their stronghold is about Ameritser, a city near Lahore, where they have one of their most sacred temples, known as the Golden Temple. The Ghoorkas come from Nipaul, in the Himalayas, and show much more of the Mongolian type of feature. They are a rather short, but natty-looking set of men, armed, in addition to their rifle, with a large, curved sheath-knife, which is worn on the belt. They are very unrelenting, and rarely spare the life of even a fallen foe.

Nipaul is an independent province on the borders of Oude, but I understand there is no serious objection to recruiting for the English service.

The Guides are a fine body of cavalry, the men for which are almost entirely recruited on the northern and northwestern frontier. The Putans also furnish a share of the rank and file, but I am not fully informed as to their native district.

The field uniform of all arms of the Service is made of a material called *karkee*. It is a species of American duck of a yellowish clay color, and consists of a jacket, short trousers, and a pair of leggings called putties, being a roll of cloth wound round the leg in a spiral form from the ankle to the knee, in a manner similar to that in which race-horses' legs are bandaged.

For full dress the native as well as the European troops wear the tunic of various colors and of different facings. Red is still the prevailing color, but in conversation with officers, I gathered the impression that the *karkee* color, or drab, is the one which many favor, as it so nearly approaches that of the soil, as to make the soldiers almost undistinguishable; and I observed that when in the field, except for the turban which the natives wear at all times, it was difficult to discover a body of troops, especially if they were not on the march. The European soldier also wears his tope or sun-hat with the *karkee*, and is less observable than the native. The Ghoorkas are an exception, and do not wear the turban, but in its stead a species of skull-cap, not unlike the jaunty head-piece of the English soldier, with whom, by the by, he fraternizes more than any other of the native troops.

He drinks whiskey and associates more freely with "Tommy Atkins" than any other native, and I have heard that he imitates him in the use of strong language. I observed that the *Chief* had him as guard in front of his and the tents of his personal staff, which rather argues that he is a favorite in that quarter.

The method of pay and subsistence of the native troops forms a feature of the Indian service that is worthy of notice. The cavalry recruit brings with him either his own horse or two hundred rupees (a rupee is supposed to be worth about forty cents, but it is at present greatly depreciated), and his colonel prefers the rupees, as he can mount the man on a horse of government selection, generally on one of the animals imported from New South Wales, and usually termed "walers." Should he have neither horse nor money, the two hundred rupees are charged against him, and paid off in monthly instalments. His monthly pay differs in the different Presidencies, but

averages about twenty-eight rupees. On this he must subsist himself, purchasing his food from the natives, and, as he rarely eats meat, his wants are readily satisfied. He must also pay for the services of a grass-cutter, as one grass-cutter is allowed to two horses, and he also pays the grain contractor for the necessary short forage required for his horse.

The infantryman's pay averages about seven rupees per month, on which he must subsist himself and provide his own cooks. Here the rough quarters of a cantonment for the native troops is paid for from the soldier's allowance, and as garrisons are changed they are appraised, and the incoming troops required to take them at valuation. It will be seen that the native gives far less trouble than "Tommy Atkins," as the European soldier is usually styled. I was induced to ask how the latter got his cognomen, so generally in use, and learned that it came from the printed forms used in the English Service being signed "T. Atkins." There is a certain allowance of clothing made to all native troops on enlistment, which is afterward kept from their pay.

One of the features of this command, that is especially striking to an American, is its elephant battery of heavy guns, which I took the pains to examine quite minutely. There were really two kinds of draught, the elephant and the bullock, there being eighteen of the former and three hundred of the latter. The wheel elephant is placed in a pair of wide shafts, and has a very large, heavy, and strong saddle, not unlike a huge cart-saddle. This is attached by a heavy leathern band and iron chains to the shafts. He has also a strong breast-strap and breeching. The lead elephant is hitched in a similar manner to that in which the lead horse in a tandem team would be. The bullocks accompany the battery not only for draught purposes, for which they use from four to six yokes to each gun, but because they are indispensable in time of action, as the elephant will not stand fire. He, realizing the danger, would be liable to stampede the guns, and hence is detached when the enemy is near, and bullocks yoked in. There were some superb specimens of the latter attached to the battery. There were also two or three mountain batteries, in which the guns and parts of carriages were on the backs of mules. I did not see any very fine specimens of the latter, and don't think there are any, particularly when viewed from an American standpoint, as I believe we have the finest mules in the world. Both the horse and field artillery looked well, and the batteries are in the hands of efficient and intelligent commanders. Since the mutiny of 1857 none but Europeans have been used for this service.

Not the least interesting or noticeable feature of this Indian service is the great attention given to manly sports and exercises. Every opportunity is furnished for the development of the physique and for acquiring skill in the amusements, of which the most daring and probably the most popular is tent-pegging. This consists in riding at full tilt and taking with the lance a rather short and broad tent-peg from the ground; and you may be a little surprised when I tell you that Gen. Roberts led off in this sport, and with his team of four made the best score of the season. There were numerous other mounted and foot sports, such as lance against sword, sword against bayonet, sword against sword, bayonet against bayonet, tent-pegging with sword, cutting lemons with sword, tug of war, foot racing, and acrobatic and gymnastic feats.

The "march past" of the entire force, some 35,000, closed the Camp of Exercise. It was done in the midst of a pouring rain. By the time the cavalry and horse and foot artillery had passed the reviewing point, the dark soil had been churned into the consistency of a thin bed of mortar, and when the native infantry came by, many of whom wore only the slipper, there was a sad loss of this rather necessary appendage of the foot soldier, and I rather think this test may bring about a change. All troops, native as well as European, marched by with great precision, and the line and dress of the double companies—we style them divisions—were admirably observed. As the

elephant battery passed, the knowing animals raised their trunks and saluted, for which purpose they folded the trunk into the form of the letter S, holding it square to the front.

The appearance of the ground, in and about the slight mound where the reviewing officer was posted, calls for some attention, as it was made up of all sorts and conditions of men, from those who were in the handsome four-in-hand with native outriders, to the humble peasant who had trudged out five miles to see the grand parade. There were all sorts of mounts, but chiefly noticeable were the camels and elephants. I counted seventy-five of the latter, many richly caparisoned and provided with howdahs for carrying the families of chiefs. The sight was truly Eastern, as all the natives were in holiday attire, and the gaudy colors of their dresses made the assembly all the more picturesque.

I was a little disappointed in the number of important native chiefs, Maharaja Scindia, Raja of Gwalior, Maharaja of Kutch Behar, Maharaja of Jodhpur, Maharaja of Ulwar, Maharaja of Nadir, being all of any great importance that I heard of as being on the ground. The native contingents, however, were out in considerable force, and, although the last to march past, made a very respectable appearance.

Although the Camp of Exercise virtually closed with the review and march past given to the Viceroy on the 19th, yet the troops here remained in camp for the purpose of drying their equipments and uniforms, and also to take part in the various sports. The accredited officers take their departure to-morrow night, and are to wind up their visit by a little sight-seeing in various parts of India, at government expense. I think they must be pleased with their reception, as every thing possible has been done to render their stay agreeable. I enclose the speech of the Viceroy welcoming them to India, which strikes me as particularly happy.*

* * * * *

"Again, on the other side are two other officers whose presence here is as grateful to my feelings as that of any of their colleagues, inasmuch as they represent the Army of the United States, a country which I had often occasion to visit when Governor General of Canada, and whose border I never passed without experiencing at the hands of its inhabitants such an amount of kindness and hospitality as it would be impossible for me to forget."

* * * * *

Before closing I wish to add my testimony to the personal magnetism of General Roberts, Commander-in-Chief. I listened to the brief and extemporaneous dinner speech welcoming the foreign officers, and it seemed so happy, so easily delivered, and so telling, that I regretted seeing him sit down. He is known among the troops as "Our Bob's," and I can readily understand how it is that I hear from every quarter that they are greatly attached and ready to go wherever he leads.

I leave this camp to-morrow afternoon for Agra and other points further to the eastward, and it's possible, if I find any thing that I think may interest you, you may hear from me again. * * *

DE LANCEY FLOYD-JONES,

Colonel United States Army (retired).

III.

THE HANCOCK MONOGRAPH.

From the Editor of the "Century."

"We are grateful to you for sending us the Hancock Memorial volume, of which you have a right to feel proud. It is handsomely arranged and printed; and, better

* For want of space it is only possible to print a brief extract here.—[EDITOR.]

than that, it is exceedingly interesting. And where will we find a more fascinating Man of Battle than Hancock?"

From General Frank Wheaton, U. S. A.

"I shall have the greatest interest and pleasure in encouraging our officers to buy copies of the admirable tribute to the memory of our gallant Hancock. Though never in the corps, yet the Sixth (Franklin's and Sedgwick's), in which I served, was always near the Second; and out of my own corps, I had, during the War, no dearer friend than the greatly loved Hancock. I saw him last in '68. I was ordered North to recover from yellow fever, and my last morning in New Orleans was spent with Hancock, who came to bid me good-by and chat over our numerous pleasant war reminiscences. He loved Sedgwick's corps next to his own, and was always showing his kind interest in its division and brigade commanders."

From the Recorder, Illinois Commandery M. O. L. L. U. S.

"I was pleased to have my attention called to this graceful tribute to the memory of the late Commander-in-Chief of our Order. I have ordered, through one of our booksellers, forty copies of the Monograph, for different companions, and hope that many more will be wanted." * * *

From General Don Carlos Buell.

"Yesterday I received the Hancock Monograph. It is a beautiful tribute—more gratifying, to my mind, than a monument of stone, for every line tells of a knightly and pure character, while the stone might leave room to imagine many more blemishes that are not rare even among popular favorites."

MRS. HANCOCK gratefully acknowledges the receipt of the Resolutions of sympathy and condolence, adopted by the COUNCIL OF THE MILITARY SERVICE INSTITUTION, upon the death of her dear husband, and so kindly transmitted to her by General Rodenbough.

GOVERNOR'S ISLAND, March 25, 1886.



REVIEWS & INSPECTIONS

SNEAD'S "THE FIGHT FOR MISSOURI."*

This gracefully written and vivid narration of the political and military contest which raged in Missouri, from the election of President Lincoln, (November 6, 1860) to the death of General Lyon (August 10, 1861), is by an active participant in the events which he relates, and who, though a Secessionist, does full justice to the motives and actions of Unionists. Since the termination of that bitter struggle, he has had ample time for the study of his theme which he discusses with great clearness and candor. "For military details," says the author, "I am indebted above all to the Official Records which the Government is publishing. The zeal, the fairness, the intelligence, the care, and the ability, with which they have been collected, compiled, arranged, and edited by Lieutenant-Colonel Robert N. Scott, U. S. A., entitle that gentleman to the gratitude of every one who took an honorable part in the war, and of all who shall ever desire to learn its true history."

It is unnecessary to speak of the antecedents which precipitated this struggle in Missouri, a slave State, but containing a large element that appreciated the priceless value of the Union. The several parties in the State soon arranged themselves into two—Secessionists and Unionists. Conspicuous among the leaders of the former were the Governor and Lieutenant-Governor, and of the latter Francis P. Blair, Jr., and Nathaniel Lyon. The Governor had the advantage of the State machinery, while Blair and Lyon had the support of the general Government. Both sides were active and defiant, but, February 18, 1861, the State declared against secession by a majority of 80,000. The Governor and his adherents saw that war was inevitable, and urged that the first duty of the State was to prepare for it and arm in her own defence.

The seizure by the seceding States of the Government forts and other public property,

* "The Fight for Missouri," by Thomas Snead. New York: Scribner's Sons, 1886.

early in the winter of 1860-61, naturally turned the attention of the Missouri Secessionists to similar action for obtaining the sinews of war within their reach. These consisted of nearly half a million dollars in the vaults of the Sub-Treasury at St. Louis, and 60,000 stand of arms, with a large supply of ammunition, at the Arsenal near that city. The struggle now turned upon the possession of these prizes.

Brigadier-General William S. Harney, a patriotic and gallant veteran of the U. S. Army, was in command of the Department of the West, and Frank Blair was at the head of the "Home Guard," a Unionist organization. On the side of the Secessionists were the Governor, constitutionally the Commander-in-Chief of the State forces, and General Daniel M. Frost at the head of a brigade of Volunteer Militia which included five companies of "Minute Men," young, ardent, and full of zeal.

The Governor, relying upon Frost, had no doubt of getting possession of the arsenal, as its commandant, Major Bell, was a Southerner. But Bvt.-Major Hagner soon superseded Bell, and Captain Lyon was ordered to St. Louis to command the regular troops. For a time he was foiled by superior authority in his purpose to command the arsenal, but ultimately attained his object by securing the removal of Hagner. Lyon certainly was the man for the occasion, and never lost sight of the important object—the retention of Missouri in the Union. He established the closest relations with Blair and the prominent Unionists, and by his boldness, zeal, and readiness to assume responsibility won their entire confidence.

The fall of Fort Sumter, while it aroused and united the North, inspired the South with confidence in its ability to resist successfully the whole power of the Government. The Governor refused to honor the President's requisition for Missouri's quota of troops, sent commissioners south to obtain siege guns, ordered Frost's brigade into encampment, and summoned the General Assembly to meet at the capitol on the second of May to provide the means "required to place the State in a proper attitude of defence."

The Secessionists' plans for seizing the St. Louis Arsenal having been discovered by Harney and Lyon, the latter did not ask nor wait for instructions, but immediately called upon the Governor of Illinois for troops and occupied the hills commanding the arsenal, and also the streets adjacent thereto. The latter act was disapproved by Harney as being in violation of city ordinances. Lyon, in such emergencies, having no regard for the letter of the law, cut the Gordian knot and, with Blair's assistance, had Harney suspended from command.

Lyon, being now in absolute control, armed the Home Guards and sent the surplus muskets and munitions from St. Louis to Illinois, which ended the contest for the arsenal.

The Governor, though balked by the determination and activity of Lyon, was still resolute. He purchased other arms and ammunition, and Frost established his camp (Jackson) in the western part of the city. Blair and Lyon, always alert, saw the danger involved in the Governor's preparations. Lyon, now in command of the Department of the West, promptly obtained authority to enlist 10,000 men and proclaim martial law in St. Louis.

He made a reconnaissance of Camp Jackson in the disguise of an old woman, and on May 1st demanded and secured the immediate and unconditional surrender of this "nest of traitors."

Pending further preparations for the inevitable contest, the Secessionists, knowing their weakness, asked for a conference to adjust matters without a bloody collision. The conference took place June 11, 1861, between Governor Jackson and General Price, and the author of the book we are considering, on the one side, and Colonel Blair and General Lyon on the other. Lyon opened the parley by saying that the dis-

cussion on the part of his Government would be conducted by Blair ; but hardly had half an hour elapsed before Lyon took the matter into his own hands, holding his own at every point against Jackson and Price, masters though they were of Missouri politics, whose course they had been directing and controlling for years, while he was only captain of an infantry regiment on the Plains." When the conference had lasted four or five hours, Lyon closed it. "Rather," said he, (he was still seated, and spoke deliberately, slowly, and with a peculiar emphasis) "rather than concede to the State of Missouri the right to demand that my Government shall not enlist troops within her limits, or bring troops into the State whenever it pleases, or move its troops at its own will, into, out of, or through the State ; rather than concede to the State of Missouri for a single instant the right to dictate to my Government in any matter however unimportant, I would" (rising as he said this, and pointing in turn to every one in the room) "see you, and you, and you, and you, and you, and every man, woman, and child in the State, dead and buried." Then turning to the Governor, he said : "This means War. In an hour one of my officers will call for you and conduct you out of my lines."

We have not space to detail the well-devised campaign which followed. Suffice it to say that Lyon sent Sweeny and Sigel to the Southwest, while he with his remaining forces advanced upon Jefferson City, putting the State Government to flight, and then moved upon Boonville to control the Missouri River and all the country between it and the loyal State of Iowa.

The Secessionists, defeated at Boonville, retreated south, and on the way encountered Sigel's inferior force which they defeated at Carthage. At the same time McCulloch, moving from Arkansas, joined Price and marched to the rescue of the Governor and his Missouri troops, hard pressed by Lyon and Sturgis moving so rapidly that they accomplished "nearly fifty miles in one day" of hot July. Lyon reached the vicinity of Springfield with about 7,000 weary men and found himself confronted by the superior united Confederate and Missouri forces. He asked Frémont for reinforcements, but not a man came to his assistance, and not even a message to encourage him. To retreat was difficult, and was to abandon the Southwest and its teeming resources to the Confederates, and possibly to wreck the Union cause. Accordingly, with his brave spirit, which never quailed, he decided by a forced march to surprise, at day-break, the enemy encamped on Wilson's Creek, and trust every thing to the hazard of a battle.

It is unnecessary to describe the bloody conflict of Wilson's Creek. Wherever the contest was hottest, there was Lyon, on his iron-gray charger, encouraging his men to new efforts, and inspiring all with his own dauntless purpose. Though severely wounded and his horse killed under him, he mounted another, swung his hat in the air, called upon his men to follow him, dashed into the thickest of the fray, and fell, shot through the breast.

Thus fell a hero possessing the tenacity of Grant, the valor of Hancock, the intrepidity of Kearny, the patriotic zeal of Halleck, and no little of the organizing faculty of McClellan. Had he lived he would have become one of the brightest stars in the galaxy of the Great Rebellion.

Colonel Sneed's graphic contribution to our history must be read to gain any adequate idea of its merits.

"Lyon," says he, "by capturing the State militia at Camp Jackson, and driving the Governor from the capital, and all his troops into the uttermost corner of the State, and by holding Price and McCulloch at bay, had given the Union men of Missouri time, opportunity, and courage to bring their State Convention together again ; and had given the Convention an excuse and the power to depose Governor Jackson and Lieu-

tenant-Governor Reynolds, to vacate the seats of the members of the General Assembly, and to establish a State Government, which was loyal to the Union, and which would use the whole organized power of the State, its treasury, its credit, its militia, and all its great resources, to sustain the Union and crush the South. All this had been done while Lyon was boldly confronting the overwhelming strength of Price and McCulloch. Had he abandoned Springfield instead, and opened to Price a pathway to the Missouri; had he not been willing to die for the Union, none of these things would have been done. By wisely planning, by boldly doing, and by bravely dying, he won the fight for Missouri."

Missouri was saved; but it subsequently required the iron will and great administrative power of Halleck to bring order out of chaos, and utterly extinguish the embers of rebellion that long glowed within its borders.

G. W. C.

WINTHROP'S "MILITARY LAW."

Colonel W. Winthrop, Deputy Judge-Advocate-General, United States Army, reprints in an appendix to his valuable work on "Military Law," several of the most important English military codes. Amongst others he reproduces that of James II., and the Articles of War which were in force at the time of the American Revolution, and which were adopted by the Americans. It is not only interesting, but highly instructive for the purposes of interpretation, to trace the individual Articles of War back to their origin, and for this purpose it would seem desirable to refer to a code which largely fills the gap between the two referred to. This will be found to be the case with the articles of 1718, which mark an epoch in the history of English military law.

The law military, as a branch of the law of the land, legally operative in the time of peace, was then in its infancy. Only twenty-eight years before this date Parliament first recognized the necessity of providing by law for the punishment of certain military offences in time of peace. This legislative act, however, was very defective, and its defects were supplied by the Articles of War promulgated by the Crown, but it was not until the session of 1717-18 that the power of the Crown to issue such articles, to be in force *at home* in time of peace, was recognized by Parliament.

The articles of 1718 were the first issued by the Crown by virtue of this legislative authorization; and it does not seem that there was at that time any dread of the consequences of a recognition of such a prerogative power; for the debate in Parliament did not run on this subject, but on the power of courts-martial to punish mutiny and desertion with death—a question with reference to which there was much difference of opinion, and which was at first carried by a majority of eighteen only.

The Articles which follow are reproduced from Rapin's "History of England."

G. N. L.

BRITISH ARTICLES OF WAR OF 1718.

I. All officers and soldiers (not having just impediment) shall diligently frequent divine service, in such places as shall be appointed for the regiment, troop, or company to which they belong; and such as either wilfully or negligently absent themselves from divine service or sermon, or else being present, do behave themselves undecently or irreverently during the same, if they be officers, they shall be severely reprehended at a court-martial; but if private soldiers, they shall for every such first offence, forfeit each man 1s., to be deducted out of their next pay; and for the second offence shall forfeit 1s. and be laid in irons for twelve hours; and for every like offence afterwards, shall suffer and pay in like manner; and the money so forfeited shall be applied to the relief of the sick soldiers of such troop or company to which the offender does belong.

II. If any sutler, in any of the forts, garrisons, camps, barracks, or guards shall, during divine service or sermon, presume to sell any beer, brandy, wine, or other liquors, or any kind of victuals, or other merchandise, he shall be delivered over to the civil magistrate, to be punished according to law.

III. Whosoever shall use any unlawful oath or execration (whether officer or soldier) shall incur the penalties expressed in the first article.

IV. If any officer or soldier shall presume to blaspheme the holy and undivided Trinity, or the persons of God the Father, God the Son, or God the Holy Ghost, or shall presume to speak against any known article of the Christian Faith, he shall be delivered over by the commanding officer to the civil magistrate to be punished according to law.

V. If any officer or soldier shall abuse or profane any place dedicated to the worship of God, or shall offer violence to any chaplain of the army, or any other minister of God's word, he shall be liable to such penalty or corporal punishment as shall be inflicted on him by a court-martial.

VI. If any officer or soldier shall presume to use any traitorous or disrespectful words against the sacred person of his Majesty, his Royal Highness the Prince of Wales, or any of the royal family, or shall behave himself with contempt or disrespect toward the General or other commander-in-chief of the forces, or speak words tending to his hurt and dishonor, he shall be punished according to the nature of his offence, by the judgment of a regimental or general court-martial.

VII. If any officer or soldier shall excite, cause, or join in any mutiny or sedition in the company, troop, or regiment to which he belongs, or in any other company, troop, or regiment in his Majesty's service, or on any party or post where the duty is done by detachment from several regiments or otherwise, in the army, he shall suffer death, or such other punishment as a general court-martial shall inflict.

And if any officer, non-commissioned officer, or soldier shall hear any words tending to mutiny or sedition, or being anyway privy thereto, do not immediately use his utmost endeavors to suppress the same, as also to discover it to his superiors, if an officer, he shall be cashiered; if a non-commissioned officer or soldier, he shall be severely punished at the discretion of a court-martial.

VIII. If any officer or soldier shall refuse to obey the lawful orders of his superior officer, he shall be punished with death, or otherwise, as a general court-martial shall think fit.

X. All officers and soldiers who have received pay, or have been duly listed in our service, and shall desert the same, either in the field, upon a march, in quarters, or in garrison, and be convicted thereof before a general court-martial, shall suffer death, or such other punishment, as by the said court shall be inflicted.

XII. If any officer or soldier shall persuade or advise any other officer or soldier to desert our service, he shall suffer such punishment as shall be inflicted by the sentence of a general court-martial.

XVI. If any officer, non-commissioned officer, or soldier, shall be accused of any capital crime, or of any violence or offence against the person, estate, or property of any of our subjects, which is punishable by the known laws of the land, the commanding officers of every regiment, troop, or company, are hereby required to deliver over such accused person to the civil magistrate, so soon as applied to; and are also to be aiding and assisting to the officers of justice in the seizing and apprehending such offender, in order to bring him to trial, under pain of our highest displeasure.

XIX. No officer or soldier shall use any reproachful or provoking speeches or gestures to another, upon pain of imprisonment, and asking pardon of the party offended, in presence of his commanding officer.

Nor shall any officer or soldier presume to send a challenge to any other officer or soldier to fight a duel, upon pain of being cashiered, if he be an officer; or suffering the severest corporal punishment, if a non-commissioned officer or private soldier. And if any officer or non-commissioned officer, commanding a guard, shall wittingly and knowingly suffer any person whatever to go forth to fight a duel he shall be punished as above; and all seconds also, and carriers of challenges in order to duels, shall be taken as principals, and punished accordingly.

All officers of what condition soever, have power to part and quell all quarrels, frays, and other disorders, though of another company, troop, or regiment; and to command officers to arrest, and soldiers to prison, until their proper officers be acquainted therewith.

And whoever shall refuse to obey such officers (though of inferior rank) or draw his sword upon him, shall be punished as a general court-martial shall appoint.

Nor shall any officer or soldier upbraid another for refusing a challenge, since, according to these our orders, they but do the duty of soldiers, who ought to subject themselves to discipline; and we do acquit and discharge all men who have quarrels offered, or challenges sent to them, of all disgrace or opinion of disadvantage in the

obedience hereunto ; and whosoever shall upbraid them, and offend in this case, shall be punished as a challenger.

XXI. Every non-commissioned officer and soldier who shall enlist himself in our service, shall, at the time of his so enlisting, or within a month afterwards at the farthest, be taken before a Justice of Peace by the enlisting officer, or the officer commanding the troops or company into which he has listed, and shall there take the following oath :

I swear to be true to our Sovereign Lord King George, and to serve him honestly and faithfully in defence of his person and dignity, against all his enemies and opposers whatsoever, and to observe and obey his Majesty's orders, and the orders of the Generals and officers set over me by his Majesty. So help me God.

XXVIII. All officers and soldiers are to behave themselves orderly in quarters and on the march ; and whoever shall commit any waste or spoil, either on walks or trees, parks, warrens, fish-ponds, houses or gardens, corn-fields, inclosures or meadows, or shall maliciously destroy any property whatever belonging to any of our subjects, or belonging to any person whatever, unless by order of the then commander-in-chief of our forces, to annoy rebels, or other enemies in arms against us, he or they, that shall be found guilty of offending therein, shall (besides such penalties as they are liable to by law) be punished according to the nature and degree of the offence, by the judgment of a regimental or general court-martial.

XXIX. No officer shall demand billets for quartering of more than his effective men, nor quarter any women or children in the house assigned him for the quartering of officers and soldiers, without the consent of the owner, nor shall take money for freeing of landlords from quartering of officers or soldiers, under pain of being cashiered for it.

XXX. Every officer commanding a regiment, troop, company, or party, whether in settled quarters or on the march, shall see his own quarters, and the quarters of every officer and soldier under his command, paid, according to the rate specified in the act of Parliament now in force.

And upon every payment to be made in quarters, the said officer shall give public notice thereof to the landlords, in order to see them satisfied as aforesaid. And in case any such regiment, troop, company, or party, shall be ordered to march, before money may be come to the hands of the commanding officer as aforesaid, he is hereby required before his departure out of any town or village, to make up the accounts with all persons concerned in money due to them in quartering of officers or soldiers, for what time soever he shall have happened to remain there ; and grant to every such party a signed certificate for the same, therein specifying the name of the regiment, troop, or company such officers or soldiers do belong to, under pain of being cashiered for it, upon proof of having wilfully offended herein.

XXXI. On marches, the commanding officers are to apply to the proper magistrates for the carriages necessary for the service, and to pay for them according to the Act of Parliament in that behalf, taking care not to abuse, nor to suffer any under their command, to beat or abuse the wagoners, or other persons attending such carriages, nor to put more than twenty hundred weight on any wain or wagon so furnished to them by the country.

And whatever officer shall be convicted of offending herein, or of refusing to grant certificates in case of failure of money, as in the preceding article, shall, by the judgment of a general court-martial, be cashiered or otherwise punished, according to the degree of his offence.

XXXII. All officers commanding in garrisons, in quarters, or on marches, shall keep good order, and redress all such abuses or disorders as may happen to be committed by any officer or soldier under their command ; and if on complaint made to any such commanding officer, of beating of landlords, or extorting of more from them than they are obliged by law to furnish ; of soldiers disturbing of fairs or markets, or committing any other kind of riot, to the disturbing or disquieting our people, he, the said commander, who shall refuse or omit to see justice done to the offender, and reparation made to the party injured, so far as part of the offender's pay can enable him, he shall, upon proof thereof, be punished by a general court-martial, as if he himself had personally committed the crimes or disorders complained of.

XXXVII. If any officer shall protect any person from his creditors, otherwise than is allowed by the present act of Parliament, or any one who does not actually serve in the ranks, and consequently do all the duties of a soldier (according to the true intent and meaning of the said act), he shall be cashiered for it.

XLIV. In case any officer, non-commissioned officer, or soldier be accused of

any violence against the person, estate, or property of any of our subjects, punishable by any of our civil courts or magistrates, the officers to whom such accusation is brought shall not proceed to the trial of such offender or offenders by a court-martial within the space of eight days, unless at the desire of the person or persons injured; and in case no application be made to the commanding officer in quarters during the space of eight days by the person or persons injured, the offender or offenders may be tried by a court-martial for any offence mentioned in these articles, provided that, within the space of the said eight days, the person injured hath not proceeded to the prosecution of such offender before a civil court or magistrate, and notice given thereof to the officer commanding in the quarters where such offence shall be committed.

XLV. These, our rules and articles, are to be observed by, and do in all respects regard, our troops and regiments of horse- and foot-guards, as well as our other forces.

XLVI. The foregoing rules and articles shall be read and published at the head of every regiment, troop, and company mustered, or to be mustered, in our service, once every two months at furthest, and are to be duly observed by all officers and soldiers in our service, and also by our companies of gunners, and other military officers of our trains of artillery, with such alterations only as relate to the payment of soldiers' quarters and carriages, which in the kingdom of Ireland are to be regulated by the Lord-Lieutenant thereof, and in our islands, provinces, and garrisons beyond the seas, by the respective governors of the same, according as the nature of the thing shall require; and notwithstanding it is expressed in the sixteenth article of these, our rules and orders, that every commissioned officers is required to deliver up to the civil magistrate all such persons (under his command) as shall be accused of any crimes which are punishable by the known laws of the land, yet in our garrison of Gibraltar, island of Minorca, forts of Placentia, and Annapolis-Royal, where our forces now are, or in any other place beyond the seas to which any of our troops may hereafter be commanded, and where there is no form of our civil judicature in force, the governors or commanders respectively are to appoint general courts-martial to be held, who are to punish criminals by their sentence, as has been practised heretofore and authorized by former articles of war.

METCALFE'S "ADMINISTRATION OF WORKSHOPS."

Captain Henry Metcalfe's "Cost of Manufactures and the Administration of Workshops," will meet a most hearty reception, not only by those engaged in Government work, but from a large class composed of the owners of private workshops and their employes occupying positions of trust and responsibility. (For title see p. 225).

The improvement in tools during the past few years has revolutionized work in almost every branch of manufacturing. A machinist who served his apprenticeship in the days of the "cold-chisel and file," in many cases now finds himself in competition with so-called mechanics who know only enough of their trade to run a shaper or a grinding-machine.

The great improvement in machinery, the multiplication of "special machines," and, as incident, the more perfect systematizing of labor, has revolutionized the "shop cost" of production and induced close competition between manufacturers in the same lines. Hence the more vital to each becomes the need for accurate knowledge of these costs, as well as for a clear, concise, and reliable form of record for ready reference.

The advance in this direction, however, as is well known and generally so admitted, has not kept pace with other improvements, and to-day, in a large majority of the establishments in this country, the same books and records are kept, and in the same form, as twenty years ago. This probably arises largely from the fact that in most instances the master-minds are more mechanical than clerical in their tendency, and any effort on the part of an intelligent and zealous secretary to institute a better system of records is usually suppressed as "too much red tape" by an employer who would heartily encourage any improvement to cheapen his product and increase his profits, if by mechanical means.

Just herein lies the greatest obstacle in the way of securing a better system of records—the hackneyed cry of “red tape.”

It has been remarked that few engineers understand the relation existing between engineering and a dollar. The same may be said of the man who has an appreciation of the necessity of a system of records in an industrial establishment. Captain Metcalfe has certainly suggested methods that are simple, once thoroughly understood, and while they may not be applicable to every workshop, or, as a whole, to any outside of the Government service, still competent minds can work out from them a system fitted for any industry.

The old shop-records must certainly give place to something better, as the old tools have, and while those who are working this system successfully will look on and wonder that so efficient a method is not appreciated (as we do that English and Continental railroads do not adopt our system of metal baggage-checks), still it will be slow work, as it is so radical a departure, and though in the main apparently simple and effective, still the old prejudice against “red tape” will not be lessened by the fact that it emanates from the Government service.

As applied to the arsenals, where the system has been put in operation, its success must from the first have been assured. Here, then, is a far greater opportunity for the instruction of subordinates, and, what is of more consequence, an absence of the “old fossil” so common to every long-established private workshop, who always has the inclination, and too often the power, to block any advance in this direction. Then, again, as the complete success of Captain Metcalfe’s system is dependent upon the intelligence of the workmen and foremen, it will undoubtedly be easier to introduce in Government work, where the average is certainly higher among mechanics than in private workshops.

We repeat that we look for a hearty reception for Captain Metcalfe’s work, as it is a want fully realized, and the originality of his suggestions will be of great value in stimulating manufacturers to work out a method suitable to their own individual wants.

H. G. H. T.

MASSEY’S “MILITARY POLICY OF THE U. S.”

The defence of our sea-coast is a problem which has received much attention within the past year. That we are now practically defenceless, has been conclusively proven by many official reports and private publications, and the recent able report of the Fortification Board gives in much detail the steps necessary to remedy the existing state of things.

Writers have pointed out the dire results certain to follow the declaration of war with any of the important European powers should nothing be done for the better protection of our coast; but, so far as I am aware, Lieutenant Massey is the first to discuss the question as to “what military policy and action should obtain” in such an event.*

He evidently approaches the subject with diffidence, pleading “orders” as his excuse for “venturing suggestions as to ‘what we must do to be saved.’”

To prevent the enemy from effecting a lodgment on our coast the author would divide it into suitable districts, to each of which would be assigned a part of the regular army and a militia force. Each district of defence should be able to protect itself.

*“Assuming the Present Defenceless Condition of the Seaboard of the United States, what Military Policy and Action should Obtain in the Event of a Sudden Declaration of War by a Foreign Power?” by Solon F. Massey, First Lieutenant, 5th Artillery, Fort Monroe, 1886.

Lieutenant Massey, concludes, however, that no such invasion would be attempted. "The object of the hostile expedition would be more easily accomplished by attacking cities, navy yards, etc., than by landing and thus allowing our immense population to take part directly in the national defence."

It is almost certain that such would be their course, and Uncle Sam would have little use for the million and a half of men who answer "Ready!" when he sounds his bugle "from some peak on the Rocky Mountains."*

To oppose the capture, bombardment, or forced ransom of our great seaports, Lieutenant Massey would make the most of such guns as we possess, of which he considers the thirteen-inch and ten-inch sea-coast mortars as the most valuable. He, however, relies more on fixed and floating obstructions and submarine mines, especially the latter, to hold in check a hostile fleet.

Submarine mines are discussed in some detail, but the facts and figures given would not tend to relieve the fears of large owners of real estate on the seaboard.

This discussion is particularly valuable, not from the suggestions for defence which it presents, but because of the paucity of such suggestions. When a careful student, after thorough research and consultation with older, and hence, presumably wiser officers, cannot present a more effective plan of defence than does Lieutenant Massey, our case is indeed desperate, and this pamphlet cannot fail to carry conviction to every reader as to the hopelessness of a struggle with any foreign power in our present condition.

E. G.

STRAUS' "ORIGIN OF REPUBLICAN FORM OF GOVERNMENT." †

It is the modern fashion in writing history to discard the old annalistic method, and to treat rather of epochs and turning-points, grouping important events about some particular event or man as a centre, noting causes and effects rather than the strict chronological order of things. This little book is in line with this good modern method. The author undertakes to show why our forefathers selected the republican in preference to any other form of government, and in the course of his discussion brings pretty clearly into view many of the perplexing questions and important events with which the fathers of our country had to deal. Where did they get their ideas of government? is the question which he attempts to answer. "Ecclesiastical causes which operated from the time the Pilgrims set foot upon our continent," and "the direct and indirect influence of the Hebrew Commonwealth," were in the opinion of the author the chief causes which determined the selection of our present form of government, and an interesting and strong array of facts and arguments is produced in support of this opinion. The book is valuable because it brings out very clearly the influence which these two causes had in shaping the union of these States, and defining their relations to each other. Perhaps too little stress is laid upon the influence of the circumstances and necessities of the colonists, the environment of the infant States. On that point men will differ so long as they fail to agree upon the relative influence of heredity and environment upon the development of the individual.

Many will thank the author for the earnest plea which he makes in closing for zealously guarding the religious liberty of the whole people. "Let," he says, "those narrow-minded men who would corrupt the grand charter of our liberties by sectarian amendments, read the record of their country's birth, and from it learn that civil and religious liberty in spirit are inseparable, and when they strike down the one they

* *Chicago Inter-Ocean*.

† "The Origin of Republican Form of Government in the United States of America," by Oscar S. Straus, pp. vi., 149. G. P. Putnam's Sons.

destroy the other. Freedom of person, freedom of conscience, and honest government constitute the creed of our political faith, and they alone can secure peace, liberty, and safety."

RECENT BOOKS FOR YOUNG PEOPLE.

Perhaps no more remarkable instance can be found of the change which the last few years have produced in the literature for schools and the young than the two books whose titles are appended. The fine paper, clear readable type, profuse illustration, and serviceable, tasteful binding are great improvements upon the school-books of an earlier generation, and must exercise a happy influence upon those for whom they are specially intended, rendering the paths of knowledge more easy and delightful. Nothing so quickens attention and fixes events and persons in the memory of the young as well-chosen illustrations, maps, and portraits.

*Segnius irritant animos demissa per aures,
Quam quæ sunt oculis subjecta fidelibus, et quæ
Ipse sibi tradit spectator.*

In this respect both volumes deserve commendation, though the palm must be given to the latter. Looking at the picture on page 155 of the *Primary History*,* a boy might almost fancy himself a spectator of the crisis at Buena Vista, and that he heard Gen. Taylor's, "A little more grape, Captain Bragg"; and we venture to say, that the popular enthusiasm for liberty at the beginning of the Revolutionary war will be more impressed upon the youthful reader by the picture "Going to Boston" than by whole pages of eloquent letter-press.

The improvement in the outward form is not greater than in the spirit in which they are written. It is an effort and, on the whole, a very successful effort to abandon the dry form of annals, and to reproduce the actual life of the peoples of whom they treat, preserving enough of order and system to form a substantial skeleton, while clothing the dry facts which support the story with the flesh and blood of human sympathy and every-day life.

In both books the narrative is illustrated by the "side lights which poets and novelists have cast upon it." The author of the *Primary History* has appended to each chapter references which the ordinary teacher, as well as his pupils, will find both interesting and useful. Mr. Gilman † has woven his illustrations into the thread of his narrative. We think the former method preferable. It is better calculated to incite the pupil to extend his reading and to keep separate the fact and the fiction which illustrates the fact.

Both books contain full and satisfactory Tables of Contents, and the *Story of Rome* has an excellent Index to the Text and to the Notes. A brief Chronological Table would add to their value. We heartily commend them to those of our readers who need such books.

E. H. C. G.

RAY'S POINT BARROW EXPEDITION.‡

The melancholy interest which attaches to the painful experiences of Lieut. Greely and his brave companions in their polar expedition, has invested beforehand all chronicles of arctic travel and adventure which may appear with an especial value, and gives

* "A *Primary History of the United States for Intermediate Classes*." A. S. Barnes & Co.: New York and Chicago, 1885.

† "The *Story of Rome from the Earliest Times to the End of the Republic*," by Arthur Gilman, M.A. New York and London: G. P. Putnam's Sons, 1885.

‡ Report of the International Polar Expedition to Point Barrow, Alaska, by Lieut. P. H. Ray, 8th U. S. Infantry. Washington, D. C., 1885.

to narratives connected with the international efforts to surround and subjugate that impenetrable domain of the Ice King a sort of phenomenal importance.

It is certainly agreeable to inspect the results of Lieut. Ray's journey, his long encampment, and the explorations undertaken by him, subsidiary always to the main purpose of collecting accurate and exhaustive meteorological data, and finish the perusal without a thrill of horror at some terrible detail of suffering, or the more cruel sensations of regret and sorrow over the records of the lost.

For twenty-seven months Lieut. Ray bivouacked in the midst of the hostile powers of nature, as they are marshalled in the inclement latitude of $71^{\circ} 16'$ north, and maintained the discipline and health of his company without a break, returning laden with valuable contributions to natural history, geographical observations of interest, and a voluminous and remarkable series of meteorological data.

Point Barrow was the point selected for this circumpolar station which had never before been occupied by white men for such purposes, though frequently visited by whalers and vessels of the Hudson-Bay service. The explorers erected their observatory at the beginning of autumn, 1881, and were soon surrounded and enclosed by the horrors of an arctic winter. Their isolation during the first year had enough of novelty in it to assist their natural inclinations to keep up their spirits, and with exercise and fresh meat the scurvy was successfully repelled.

Some interesting notes were made in the spring upon the migration of birds, and the scant elements of organic life were recorded. With the second year the hardship of their situation was more keenly felt, and an expedition to the interior was organized under Lieut. Ray, which proved successful. During this expedition the alarming effect of the snow-glare was felt. Shaded glasses and goggles were insufficient protection, and the wooden shades of the natives were found quite as useful and more comfortable.

On the 29th of August, 1883, the station was broken up and the exultant observers began their joyous return to home and friends, and on October 6th reached the welcome protection of the Golden Gate.

The articles of especial interest in this volume, aside from the meteorological records, are an "Ethnographic Sketch of the Natives," by the commander, to which are appended an extensive vocabulary and a catalogue of ethnological specimens now in the U. S. Museum.

The natural-history contributions have been furnished by Sergeant John Murdoch, who, with Sergeant Smith, was an indefatigable collector, and has discovered a number of new species of crustacea, while his notes on the bird fauna are of extreme interest.

To Prof. Dall the mollusca were entrusted, and a short report on this subject is given, along with a notice of the arctic plants by Prof. A. Gray.

The extended physical observations which compose two thirds of the work are too elaborate and minute for discussion or rehearsal, but they will form a monument to the industry of the observers and to the good judgment and practical sense of those who directed and inaugurated the enterprise. G.

"THE GRAND ARMY REVIEW."

This handsomely printed and ably edited journal is one of the most recent accessions to the ranks of military periodical literature. As its name indicates, it is the "family newspaper" of the Great Army of our country's defenders, which (in obsolete but expressive phrase) "piled" its arms in 1865, and resumed the avocations of Peace. Besides providing for the literary wants of its readers in a dignified but attractive way, it keeps a vigilant eye on their material welfare, and jealously guards their political interests under the name and title of "Veterans' Rights." It deserves success.

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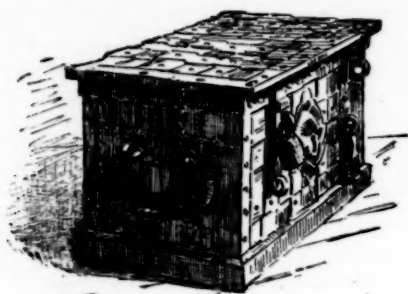
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Camp-chest

A SUNDAY MORNING IN DIXIE.

Easter Morning in the tented field! A clamor of drums, fifes, and bugles proclaiming sunrise, seconded by the braying of mules at the corral and with soft interludes by lowing kine in the yard of the field-hospital. Aroused by the sudden and protracted din from the sound, honest, sleep of a man just returned from three days of arduous picket service, I turn over with a comfortable feeling that for this time *reveillé* has no meaning to me, and seek to compose myself to renewed slumber by the aid of the monotonous refrain of the orderly sergeants as they drone out the result of morning roll-call to the sergeant-major in front of the adjutant's tent. I am well on my way back to Noddy's Land when I become conscious of strains of vocal music proceeding from the parade in front of the staff-tents, and these strains form themselves into the words of an Easter hymn, very familiar to me:

"Christ the Lord is risen to-day,
Sons of men and angels say."

Getting up with as much haste as the narrow limits of a wedge-tent render prudent, I thrust out my head to see what is afoot. Grouped about the tall pine staff upon which droops the just-hoisted garrison-flag are four men, one marking time with his hand, and him I recognize to be Raymond, the assistant surgeon, an enthusiastic Churchman and good musician. On his right is Engel, the fat commissary-sergeant, a *primo basso* in the Mannerchor, doing excellent work in a new field, under Raymond's coaching, I presume. On the latter's left hand is Monaghan, sergeant in the third company, a devout Romanist, one of the most obliging of good fellows, and possessed of a tenor voice indispensable to any choral project in our regiment. Facing the leader is Marston, lieutenant of the ninth company, a baritone of renown in the musical circles of Yorkville and Harlem.

Three anthems are given in all, the number and quality being alike creditable to the scratch quartette by which they are rendered. Early in the performance the choir is shut out of my view by the widening fringe of auditors that forms itself about the singers, and I stretch myself again on the bunk to listen and—the one faculty stirring another—to think upon past Easters and my share in their observance. A great hungering comes upon me to be at home this blessed morning, boy again—as I so lately was—and soldier in the youthful army which, in a few hours hence, shall move up the broad aisle of St. Jude's, beneath numerous standards, to the strains of that

stirring processional, "Brightly Gleams Our Banner." One thought bringing on another, I begin to form plans—dubious and half-hearted schemes they are—for attendance upon such Easter service as there may happen to be at a little parish church, built in pre-revolutionary days and standing so appropriately in the midst of its own God's acre, wherein the white gravestones, like the gleaming swords about Paradise, have thus far kept off intrusion by the sons of Mars. Imparting my hesitating thoughts to Raymond he seconds them at once in his positive, hearty way, and, thus encouraged and sure of company in whatsoever fate shall befall me, I go to the quartermaster to beg the use of a saddle-horse for the journey of a scant three miles and back. The quartermaster, who prides himself upon being "in for any thing," invites himself to be of the party, and just as we are about ready for an early start, Fred. Marston, lieutenant in a New Hampshire regiment brigaded with us, comes into camp to cement, by a promised visit, a friendship formed in the late picketing tour.

Marston's inopportune but otherwise welcome arrival leads me to propose my withdrawal from the expedition, but Raymond, ecclesiastically speaking, is unwilling to hunt otherwise than in couples, and the quartermaster, upon the principle that misery loves company, buckles to Marston as a companion as little versed as himself in the mysteries of Easter observance according to the Anglican confession, and, providing the new-comer with a horse, we set out merrily.

"Sweet day! so cool, so calm, so bright;
The bridal of the earth and sky."

Such the words in which tuneful George Herbert, centuries ago, described a day like this. The grass is in places thick and green, the hum of insects and the notes of birds come from the occasional patches of woodland that warfare has spared, and here and there a young daisy or other precocious wild-flower gives varied beauty to the half-brown, half-emerald carpeting of the fields. We pass camp after camp, wearying not of the ceaseless courtesy of salutation, and coming at length to the cantonment of a considerable park of artillery, we see, a little beyond and in front of it, our goal, seated at the junction of two county roads, well inside the lines, but enjoying, with its approaches, a complete isolation from the touch of war. The call to prayers is pealing from the little belfry as we dismount at the hitching shed, and we note with surprise how large a congregation is coming together, and with sorrow the almost total absence of able men in its composition. The quartermaster casts a keen eye over the array of saddle, pillion, and draught horses which, with an ox-team or two, have borne the worshippers to church, but I do not think he will find it profitable to send a foraging party after many of them to-morrow. There is a sprinkling of Union officers and soldiers, and a tall, stalwart, handsome man, badly crippled, with unmistakable remnants of a Confederate uniform upon him.

Entering the church, our party is silently directed by the old negro sexton to one of the high-backed pews of the last century with which the church is furnished. I throw furtive glances about the edifice, taking in the high-pitched oaken roof, the pointed and lozenged windows of stained glass, the little organ with brazen pipes, the antique furniture of the chancel, the quaint chandeliers, the small but refreshing show of Easter flowers about the white-draped communion table, and the memorial tablets to translated worth here and there upon the walls. I notice that the choir, like the organist, are all women, and I think, with a pang, how the passions of men subdue even the sacred offices of religion to their earthly exigencies. I remember with uneasiness the discussion we have had along the road as to the probability of the minister's following the revised rubric of his church and reciting the prayer for the so-called President of the Confederate States, and of Marston's patriotic though sacrilegious threat, in that event, to rise in his place and rebuke the utterance of treason upon the

soil of the United States. I smile inwardly at Raymond's casuistical doubts whether the priest would be morally justified in disobeying a canon of the church, even upon the hazard of martyrdom; I wither again under his scorn at my latitudinarian suggestion that the celebrant might alter the collect into a prayer for "the President of these States," and so please everybody; I trust that the bluff quartermaster's curtly expressed opinion, that "the parson" would in the nature of things omit the offensive prayer, may prove prophetic, and I nearly laugh aloud as I recall his addenda, that if his long-expected appointment as a staff quartermaster did not come along soon, he should be in a frame of mind to damn both Presidents, and all others in authority, with strict impartiality.

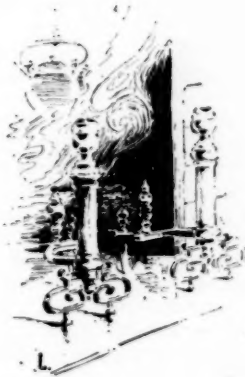
But here is the rector, robed and ready for his holy ministrations; an old man, greatly like the portraits of Gen. Lee, with that Virginian accent which, even to my Northern ear, rarely mars while it often emphasizes the beauty and force of the ancient language of the prayer-book. As the service progresses, the ever-recurring incongruity between its suggestions and the actual state of external things strikes upon my perturbed mind in a manner almost torturing. Here are we kneeling within half-gunshot distance of fully two score of brazen-throated monsters, capable and probably destined to belch upon the land, literally or figuratively, every one of the terrors enumerated, and to the invocation, "From lightning and tempest, from plague, pestilence, and famine, from battle and murder, and from sudden death," we answer in chorus: "Good Lord, deliver us!" Never till now have I felt the meaning of such a prayer as this: "That it may please Thee to defend and provide for the fatherless children and widows, and all who are desolate or oppressed." O anxious mother! dependent upon thine enemy for the little luxuries thy forlorn children crave, may it not be accounted against thee if thou hearest in stubbornness thy good Lord beseeched "to give and preserve to our use the kindly fruits of the earth, so that in due time we may enjoy them." As for me, Pharisee and whited sepulchre as I am, what uncast devil possesses me that I should lay the appeal, "Remember not, Lord, our offences, nor the offences of our forefathers; neither take Thou vengeance of our sins," to these my brethren about me? Would my earthly master at Washington, some of whose utterances have almost rivalled the Beatitudes, come here in such spirit? And this white-robed, gray-haired man of God, upon whom falls the burden of the conflict of outward seemliness with inward emotion, do not the thrill and the wail in his uplifted voice reproach me with my better fortune and less deservingness—is there no psychic power to show me that grave in the Northern prison-yard wherein lies the son he had hoped to see take up his office when he should lay it down, or the lonely daughter, whose husband, still a bridegroom by the measure of time spent with her, is, perhaps, at this moment, from the rebel camp beyond the river, gazing, like Horatius, at the white porch of a home he may enter nevermore? Heaven deal mercifully with the remnant of thy days, thou reverend old man! thou forget for me new mail of proof when, blending in thy speech the spiritual triumph of this day with the dolor of thy flock, thou liftest up thy face and spreadest out thy hands and sayest: "Though He slay me, yet will I trust in Him!"

Service over, the worshippers come forth and group themselves in neighborly gossip about the porch, and in the churchyard, and at the horse-sheds, in the sweet rural fashion. We, too, linger, for the spell of the place and time is upon us, and we would not part from our kind without the accustomed Godspeed. The old rector, coming out, sees us and seemingly divines our feeling, and what his Christly office might have withheld, his Virginian birth and breeding cannot deny. He takes each of us kindly by the hand, gravely expresses his pleasure at our remembrance of pious duty amidst the carnal distractions of the camp, deftly obtains a word or two of personal information about ourselves, and, calling two or three of the elder men of the

parish, disperses our solitude by an exchange of ceremonious introductions. We move out in a body toward the hitching sheds, where Marston, with his quick eye and ingrained courtesy, espies an old woman, attended by a comely daughter, trying to mount a pillioned brute who has taken it into his head to be ugly after his long wait upon his riders. He springs forward and fairly lifts the dame into the saddle before she is aware of his presence, and then, without pause, putting forth his hand to serve as a stirrup, he has the daughter in place on the pillion before she has time to think or to decide about any thing. For the moment both are plainly vexed at his officiousness, but Marston is busy patting the neck and caressing the nose of Rosinante, and babbling in the creature's ear about feeds of oats and hay awaiting him at home, in language suggestive of Joseph's bursting granaries in Egypt; so that when he turns his frank blue eyes upon the girl, avoiding those of "crabbed age" in the saddle, tears and laughter contend for the mastery of her countenance, and I see, by the sudden and deep suffusion of Marston's face that, despite the truce of the day, one loyal heart has received a deadly wound in the very shadow of the House of Peace.

As we regain the artillery camp we draw rein, by a common instinct, to look back at the little church. Upon it and us, and for the moment upon every thing about us, perfect stillness has settled. The gilded ball above the steeple shines gloriously in the sunlight, and there is an answering radiance upon the polished surfaces of the Napoleon guns to our left. Marston rises in his stirrups and strains his eyes in an endeavor to distinguish one among the distant groups moving homeward from the church. The quartermaster looks quizzically, yet with some tenderness, upon him, and with kindly purpose to break a tension that is becoming painful, playfully commands: "Attention, company! By fours, right about! Forward, march!" We turn our steeds and our faces as ordered, and, chiefly in silence, pursue our way toward all that Fate has, for the nonce, vouchsafed to us of the name and semblance of Home.

CHARLES F. BENJAMIN.





THE LIBRARY OF THE MILITARY SERVICE INSTITUTION has been, within the last year, entirely rearranged and placed within an accessible reading-room.

The Military Service Institution, in the establishment of a library, has for an object the collection of special books of reference on military subjects; also a working library for military students. It would therefore urge upon its members and all other persons interested in military affairs, the importance of this laudable enterprise.

So far, the collection forms an excellent nucleus. There is a complete set of the different Regulations and Tactics used in our Army from the Revolution to the present date; but this department is deficient in the more recent writings upon Modern Infantry, Cavalry, and Artillery. In American History, the sections devoted to the war of 1812 and that of 1861-65 are incomplete, especially in Regimental Histories.

Class R.—"Explorations, Surveys, and Travels" lacks many of the minor

reports made by army officers in the earlier surveys of the country; also in Local History and Maps.

Class L.—"Law" is well represented, containing an almost complete set of the different Manuals on Courts-Martial and many other excellent works of reference, and this class is especially rich in a collection of pamphlets on Mobs and Riots with various accounts of the action of the Army in 1877.

The Library Catalogue, now ready for the printer, shows a collection of 3,085 catalogued books and pamphlets, in addition to a miscellaneous lot of 1,355 books not catalogued, consisting principally of Reports, Congressional Documents, Public Documents, etc.; total, 5,040 volumes.

Additions since January 1, 1886.—The Library has received, during the present year, 643 books, pamphlets, and maps. Among them is a valuable MS. Journal, lent to the Library by Col. A. M. Clark, of Belleville, N. J. This Journal is a closely written manuscript of fifty-one pages, giving an account of the services of Capt. Swartwout, of the 2d New York Regiment in the Revolutionary War. The original commission of Captain Swartwout is attached to the Journal and reads as follows:

"This may certify that Bernardus Swartwout, the bearer hereof, is appointed Ensign in the Second N. Y. Regiment and to take rank after Mr. Brown." Dated the first of September, 1778.

(Signed) PHILIP VAN CORTLANDT.

Capt. Swartwout joined the army at the age of seventeen years, and served at

Valley Forge, in the battle of Monmouth, also in the Sullivan Expedition, and until the close of the war.

This Journal is especially interesting in its account of Sullivan's expedition and that relating to the close of the war.

The Institution also includes in its list of valuable donations a General Order Book of Governor's Island, 1814-15, from the family of the late General Harvey Brown, U.S.A., also a series of the General Orders issued by the 45th Brigade of Infantry of the State of New York, 1820-39, from Mr. A. L. Schieffelin of New York City.

The following includes only a partial list of the books added to the library since January 1, 1886:

BY DONATION.

Chief Signal Officer, U. S. A. : Expedition to Point Barrow.

Gen. J. W. de Peyster : *Chronique de l'œil de Bœuf* (8 vols.), *Anecdotes of Gen. Taylor*.

Gordon's Hist. U. S. (4 vols.), *Journal of the United Service* (London) 1829-33; also 300 other volumes of interest and value.

Gen. H. J. Hunt : *Report Light Battery M.* 2d. Arty.

Chas. E. La Motte : *Hist. 1st Delaware Infantry*.

Gen. W. W. Burns : *Hist. Phila. Brigade*.

Capt. C. Morris : *Ordinance Notes and Arty. Sch. Publications*.

Col. S. N. Benjamin : *Manœuvres of Artillery* (4 vols.), *A Treatise on Artillery* (2 vols.).

Mr. T. H. S. Hamersly : *United Service* (N. Y.), (12 vols.).

Gen. J. B. Fry : *Reports Board on Fortifications* (9 pamphlets).

Col. E. C. Dawes : *The Iron Brigade at Gettysburg, A Reminiscence of Washington and Early's Attack in 1864, A Sketch of Operations 47th Ohio Infantry*.

Col. Chas. Sutherland : *Emperor Charles V.* (3 vols.).

G. P. Putnam's Sons : *Representative Essays, Military Life in Italy, Greece, Rome* (3 vols.), *Irving's Life of Columbus, Life of Frederick the Great*; and 30 other selections from their publications.

Lieut. J. M. Califf : *Record of Services 7th Regt. U. S. C. T.*

Lieut. J. E. Sawyer : *Proceedings Royal Arty. Inst., The Company Clerk, Modern Dwellings in Town and Country, The Franco-German War, 1870-71*.

Gen. T. F. Rodenbough : *Contributions to the Annals of Medical Progress and Education in U. S., Military Record of Civilian Appointees, U. S. A., Register Army of the U. S., 1794*.

Commandery Ohio M. O. L. L., U. S. : *Cumberland Gap, Ante Bellum or, Before the War, Tour of Country and Foot-Prints of Time, Sketch of the Battle of Winchester, Bugle Blasts, Texas Before and on the Eve of the Rebellion*.

Lieut. H. C. Carbaugh : *Memoir of Major Gen. G. H. Thomas*.

Chief of Ordnance, U. S. Navy Dept. : *A complete set publications Naval Ordnance Bureau*.

The Librarian : *Hist. 11th Ohio Inf., Hist. 27th Conn. Inf., Sketches of Prison Camps, Life with the 49th Mass. Infantry*. A. W. V.



SOME REMARKS ON THE MUSEUM may be in order. The wisdom of the selection of the city of New York as a suitable location for a National Military Museum becomes more evident with each year of the progress of the Institution. Not only the officers of the Army and the veterans of former wars, but other possessors of relics and trophies throughout the country, are constantly depositing here, for safe-keeping, heirlooms of great historical interest. The special advantages of this Museum are: 1st, That it is purely military in its character, and an independent collection. 2d, That it is in no sense under Government

control, although receiving much official encouragement. 3d, That contributors do not necessarily lose their ownership in articles deposited in the Museum, but may secure their return, promptly, with but little formality. An early transfer to a building in a more convenient location in the city is hoped for.

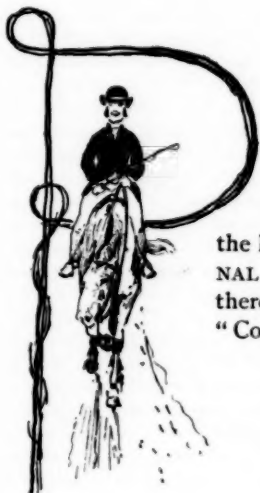
Among recent accessions to the collection is a small metal *match-box*—a three-inch cube—contributed by Mr. C. F. Benjamin, of Washington. It is a curious relic of the desk-furniture of Secretary Stanton, the Autocrat of the War Department. The most unimaginative observer can hardly fail to be impressed by this war-worn trifle. Its sand-papered sides are scarred with the sulphurous traces of countless lucifers, and its corners are blunt and chafed, as if perchance it had sometimes served as a missile in the hands of some hot-tempered individual. How many interesting things must have happened in its presence, in the long ago war-time, when the foundations of the Republic were so rudely shaken? In the Secretary's office in those days there was much making and unmaking of generals; stern consignments to military prisons; tearful petitions for clemency; occasional signing of death-warrants; stormy interviews with politicians; anxious conferences with friends upon "the situation"; announcements of victories or disasters; impromptu receptions of captured colors. These and similar incidents marked the daily grinding of the mill which produced from a harvest of death the bread of national life. But the miller—of whom we are reminded by the little match-safe—has passed away.

More directly suggestive of Mars is the venerable "Queen Anne" or "Brown Bess" *musket* just received from Major Eakin of the Artillery. It is a long flint-lock with brass-tipped ramrod, with the word "London" on the lock-plate. It belonged to an early settler of Pennsylvania, the great-great-grandfather of the present owner. According to tradition this ancestor brought down a deer with it in the Quaker City, not far from Sixth and Market streets, when Indians were numerous in that vicinity. The musket was subsequently carried in the Revolution by the Major's great-grandfather, who was killed at White Marsh. It is in excellent condition, and bids fair to survive many small-arms yet unborn.

A battered *sword and scabbard*, with the insignia of the U. S. Navy in relief upon its mountings, and attached to a primitive belt and slings of half-inch rope, comes from Lieut. Dapray, 23d Infantry. It is the sword of Ouray, late chief of the White River Utes, who died in 1879. He was a proof that Fenimore Cooper was not entirely an idealist in his descriptions of Indian character. He possessed rare qualities as a leader and arbitrator. Like the Amir of Afghanistan, he was under government pay—receiving \$1,000 annually for keeping his people in order. During the later years of his life Ouray lived like a patriarch of old—owning flocks and herds and land under cultivation; employing Mexicans as servants; driving about the country in a carriage given him by the Governor of Colorado, and occupying a comfortable house furnished in civilized fashion. With this sword, an heirloom in his family, Ouray dispensed rude justice. From his decision there was no appeal. Sheathed and hanging from its hempen belt, the sword became a sceptre—a mere sign of authority; drawn, in Ouray's hands, it was as terrible as the headsman's axe, and more than once the Chief has been known to cleave a rebellious subject from crown to chine with one sweep of the keen-edged weapon.

T. F. R.

OFFICERS OF THE ARMY and WAR VETERANS are invited to deposit interesting Relics as loans. Free transportation will be furnished upon application to "THE MILITARY SERVICE INSTITUTION, GOVERNOR'S ISLAND, N. Y. H."



POSTSCRIPT.

The following letter came to hand as the last forms of this number of the JOURNAL were going to press, and it could not, therefore, be inserted under the head of "Correspondence."—EDITORS.

IV.

AMONG THE MANDARINS.

From a Corresponding Member of Council.

HAN-KOW, CHINA.

(About Lat. 30° 32' N., Long. 114° 19' E.

Temperature in shade, 60°.)

April 6, 1886.

WHEN I closed my last letter from India, I rather intimated you might hear from me again at some point farther to the eastward, and I must confess in doing so I had China in my mind. Thinking that in that distant and little explored land there would be some military novelty that I could pick up for the benefit of your readers—something like a guard mount, a parade, or some military procession, or a barrack scene, so different from aught else I've witnessed as would serve as a real treat to the patrons of the MILITARY SERVICE JOURNAL; but I fear my hopes are likely to be thwarted, as three weeks in China have failed to produce any thing that seems especially appropriate for a military letter. In truth, I've seen very little of Chinese troops. On my visit to Canton, an excursion which I made from Hong-Kong, I had the good fortune to travel with Captain Lloyd of the steamboat *Han-Kow*, which makes daily trips between Canton and Hong-Kong, a fine boat modelled after our North River steamers, and as roomy and comfortable as could be wished. Captain Lloyd's knowledge of the river, and the various batteries which have been constructed on the Canton or Pearl river for the defences of the city of Canton, gave me a good idea of its fortifications, most of which are of recent construction. The late unpleasantness between the Chinese and French frightened them into doing something for their city. These batteries are evidently well placed, and have mounted some of the most improved and best constructed modern guns. I think Krupp has supplied some of the best; European engineers have evidently been employed in these defences, to which they add a good system of torpedoes. This scare has had another good effect, viz., to connect the central government at Peking with their various provinces and military works by a good system of telegraphs. This latter is regarded by the Europeans as the forerun-

ner of the railway. Both, I believe, are opposed by the literary and political mandarins who desire to keep the people in ignorance and the power in their own hands, but nothing would do so much toward bringing to light the acts of these officials as a good and rapid system of communications with the various parts of the Empire. One hears from every quarter of the "*Squeezes*" of these officials, which are practised as largely in military matters as in their civil callings. I have been told that their military mandarins, who seem to have most arbitrary power, are in the habit of reporting and drawing funds for the payment of a number of troops, sometimes double that which they actually have under their command. Even their great *Li-hung-Chang*, Viceroy of the province of Pe-chi-ti, and with Tien-Tsin as his head-quarters, has been reported as having drawn payment for a much larger number of troops than was actually in service. Such acts could not be successfully carried out if the communication with various sections of the Empire were rapid and frequent.* Another evidence of lack of faith in the honesty of their own officials, is shown in the custom-house system of the country, especially the dues collected from foreign nations. At the close of the last English and French war in China, about 1859, a large indemnity was demanded, but not having faith in its payment these Powers claimed the right to collect, through a commission of their own, the dues at certain ports, which was done, they transmitting the surplus to the central government. The latter, finding that the work was so honestly performed and so much more money flowing into the general treasury than before, asked this commission to organize a complete system, covering all the ports of entry throughout the Empire open to foreign trade, which is in force at the present moment. The officer in charge of this system is Sir Robert Hart. This commission has greatly extended its labors, and it now covers a good deal of ground, such as the lighting of the coast and navigable rivers, the police of harbors and rivers, and even the purchase of gunboats for the protection of shipping against pirates. The officials composing this service are made up from all the various nationalities trading with China, the number from each nation being about in proportion to the revenues paid in. The pay is liberal, and the service has called to its aid a most honorable and intelligent

* Notwithstanding such charges, *Li-hung-Chang* is regarded as the great man of the Empire, is more advanced in his views than any other official, and is actually making greater innovations upon the time-honored customs and traditions than any prominent official that China has produced for many years. I believe he favors the introduction of the railroad system and the improvement of roads. At present China has only foot-paths, or such as would only pass for these, between its most important and populous cities. Its commerce for centuries has depended upon its canals and rivers. He is one of the men of whom it is reported General Grant spoke when asked what great men he had met in the course of his tour around the world, and his reply was: "Beaconsfield in England, Gambetta in France, Bismarck in Germany, and *Li-hung-Chang* in China." He commands, I believe, the only well drilled force in the country, and owing to his treatment by the officials of the central government, never visits Peking without a body-guard of ten thousand men. I hear he has a bitter enemy in the Regent Empress, who on one occasion nearly caused his decapitation, and from which he only escaped by bribing his guards with 100,000 taels, equal to \$142,000 at present value of silver dollars. It is not unreasonable under these circumstances that he, possessing the power, should take proper precautions when paying a visit to his royal master to insure the safety of his person. These *squeezes*, to which I've made reference, are repeated at the central government, and the mandarins who chance to receive good appointments from the Emperor are, at the expiration of their term of office, invited to Peking to pay their respects to him. And should they fail to grease the palms of his subordinates, some of their weak points will be brought to light, and in place of paying a moderate sum it may cost them many thousands of taels to escape with their heads. The position of Inspector of Trade at Canton holds his appointment for three years. At the time of retiring he visits Peking on the accustomed visit to the Emperor, and he rarely gets off with less than 100,000 taels, and, beside it, he has probably put away a large fortune for future use, all of which has been made out of a salary of \$2,500. I would not repeat these stories had I not heard the same thing from different sources in various parts of China, and from parties whom I have reason to credit.

body of gentlemen, so that it ranks second only to the civil service of India. Unlike that, it has no pension system attached to it, but, in lieu, a bonus of one year's pay is given its officers at the end of each seven years' service. I believe it is in contemplation to tax the officials and create a fund securely placed, so that in the event of the Chinese government doing away with this system the interest of this fund will serve as a pension to those who may have honorably retired. But I have wandered far from my subject, and must now return to the military items variously picked up.*

A trip up this great river has added materially to my information and opened my eyes to the numbers and extent of their river defences, for at numerous points along its course apparently strong earthworks have been erected, and they seem to have shown good judgment in selecting the best sights for its defence, often, however, omitting the important consideration of protecting themselves from an attack in the rear, and forgetting that an enemy is not likely to approach from the direction you are best prepared to resist him. The earthworks below Nan-Kin furnish an example of this character, and the same may be said of some others. At many of these military stations we have observed their men idling about, but at scarcely any did we see them engaged in drilling or performing any of the duties of a soldier. Their dress is precisely the same as any civilian Chinese (colors dark and light blue), and apparently without any marks to identify them as soldiers. There was an exception to this at one or two of the military works we passed, and at these the dark blue sack or coat had its skirts edged with a broad band of red, with a red badge upon the breast containing the number of the regiment, and I am led to believe that this is the chief distinguishing facing of most of their troops; it also extends to the retainers of many of the mandarins as I've observed them in passing through the streets, the mandarin himself being usually borne in a sedan chair. I've used the latter quite frequently, and have found it rather comfortable. About Hong-Kong, which city is built upon the side of a mountain, its use was almost indispensable, the climate being, at the time I visited it, too debilitating to admit of walking up its steep streets. In visiting Chinese cities, I've usually adopted the open sedan chair (with three bearers), in order to avoid the filth of their narrow streets, and also to escape the annoyance of being jostled and surrounded by a crowd of curious men and boys. I passed a portion of yesterday in Han-Kow City, and was glad I had taken this precaution, but, whenever I entered a shop to make purchases, I had no alternative but submit to their following, and at times must have had more than fifty of them pressing uncomfortably close upon me. However, I submitted with the best grace possible, to the examination of the various articles of my clothing, watch, chain, and the like. In the course of my wanderings through the town, or, to speak more correctly, in my sedan chair-ride, I came upon one of their finest joss-houses, and through the guide asked for permission to enter, which was granted. After inspecting the central court, and the high altar or place where their chief images are kept and before which they usually burn their joss-sticks and

* Respecting the Chinese army as an organized body, I've not been able to learn that such an institution exists. The viceroys governing the various provinces are held responsible for the peace and good order of their respective charges, and it seems to rest with them to call out the local militia to the extent that they deem necessary, and this is largely made up from the coolie class, which is the lowest order in the Chinese social scale, all menial labor falling to their lot. At most all the capitals of the various provinces that I've passed there has been some little display of military, especially at the river ports, and I presume they keep there a certain nucleus into which the drafted men are received, and where they get a certain amount of military instruction. A large display of banners seems an essential feature of all their manoeuvres. As I was entering the Woorung river, on my way to Shanghai, the sailors from their gunboats were being landed, presumably for some field exercises, and the number of banners that were in line as they formed on shore was prodigious. I presume they'd soon get over such ideas if engaged in a long war, and when they discovered that such objects served as excellent targets for the enemy.

say their prayers, I was asked into an adjoining court, where I found a most respectable assemblage witnessing a theatrical performance. I was given a choice seat, asked to partake of some refreshment, such as tea, melon seeds, preserved fruits, and cakes, and treated with every consideration. I naturally inferred that I was to pay for all this attention, but they positively declined any remuneration, and I could only return their hospitality by thanks, which were uttered only in English, and I fear were poorly understood.*

It was a new experience for me to find the theatre an accompaniment of their religious edifice, but, upon arguing, learned it was quite general with the most wealthy class. I watched the performance for more than an hour, and was naturally interested, as it was my first experience. There were no women on the stage, but two were personated by men, whose make-up was so good, even to the pinched small feet, that I was thoroughly deceived as to their sex. And here I propose adding an item, for the benefit of your lady readers, respecting the mode of pinching the feet into the shapeless mass, as we "*Foreign Devils*" view it, and which so generally obtains with the aristocratic class. It is less practised in the south of China, but, in the north, no mother will permit her daughter to grow up with the feet that naturally belong to the child, as in the eyes of the "*jeunesse dorée*" she would not be a fit subject for their attentions or admiration. This operation, so far as I have been able to learn, begins at an early age, the child not being more than two or three years old. The first step is to bandage the four smaller toes so tightly under the ball of the foot that they are almost buried into the flesh. The next move is to force these up so that they rest in the hollow of the foot, making the whole thing into a lump, and leaving only it, the heel, and big toe, on which to walk. This operation is continued up to the age of fifteen or sixteen, and is attended with intense pain, the screams and moanings of the child bearing testimony to the sufferings it endures, and after the operation is complete they go stamping about much as one would who had lost both feet. There is no elasticity to the walk, and often they have to support themselves by some object. Such is the power of fashion, which is said to have had its origin with some arbitrary ruler, in order to prevent women from gadding. The universal habit of wearing pig-tails by the men, is another evidence of the influence of fashion, originally imposed upon the Chinese race by their Tartar conquerors as a symbol of servitude. It has grown to be an essential part of them, and the man condemned to cut off this appendage regards himself as disgraced.

But to return to the Yang-tsze, on which I've been travelling for the past week. It certainly is a noble river, and probably has tributary to it one of the richest sections of the globe. Its banks are lined with peasants' cottages almost the entire distance from Shanghai to this city, and the population along its entire course, added to that which lives upon lakes, canals, and rivers that are tributary to it, is estimated at 150,000,000. The soil is very rich and often produces three crops per year. The largest ocean steamers here navigate its waters up to this city, six hundred miles above Shanghai, and, but for the two rapids, heavy-draught vessels could go six hundred miles above this. Its entire length is variously stated at between twenty-five hundred and three thousand miles. Its shores bear a strong resemblance to some of our Western rivers, and like them has to be protected from over-flows by dykes or artificial embankments. Many

* I have since learned that it is often the custom for some of their wealthy citizens, especially when members of certain guilds, to entertain their friends in this mode, and this one was given on the anniversary of some one of their religious festivals. The host received his guests (all men) at the entrance of the theatre, where he welcomed them by repeated bows, which were returned, neither host nor guests offering to shake hands, but holding them in front with palms together, and when bowing, bringing the chin down close to them. One might almost say that each one shook his own hands, and this I must conclude is the fashion in the best Chinese circles, as I've never seen collected a more distinguished-looking set than those occupying the best seats in this theatre.

of China's most populous cities are situated upon its banks. I mention Chin-Kiang, Nan-king, Wukee, Ngdu-King-Foo, Kiu-Kiang, and this city with its two suburban ones of Han-Yang and Wu-Chang, are placed at over 1,000,000 of inhabitants. Most of the cities are walled and can only be entered by the gates, where a duty, resembling the octroi of France, is collected. So far as I am able to judge, these walls are in good condition, and are backed by a heavy earthen embankment. That at Han-Kow, I know to be at least twenty feet thick, and I presume many of the others are equally strong. These walls are all crenelated, which produces a pretty effect; the perimeter of the wall at Nan-king, is put at twenty-one miles, and I don't think it exaggerated. The approaches to most of their cities are usually marked by one or more pagodas, and if high ground or an eminence can be found, it is placed on the top; but the appearance of their towns is far from attractive, houses of a single story and usually of a sombre-gray color, the most prominent structures being the joss-houses and pagodas, the former with the peculiar concave shaped ridges and upturned eaves, the effect of which is rather odd and picturesque.

Notwithstanding the interest I've found in this country I should be sorry to exchange it for Japan, for which country I take my departure by first steamer after returning to Shanghai.*

Yours very faithfully,

DE LANCEY FLOYD-JONES,

Col. U. S. Army.

* Before closing this rather disjointed epistle, I wish to speak of a very nice and appropriate compliment paid by Captain Selfridge, U. S. Navy, commanding U. S. Steamer *Omaha*, who on a recent visit of Major-Gen. Cameron, commanding all British troops in China, turned out his marines and a share of his sailors, and escorted the General to the race-course where he inspected a body of the Shanghai volunteers. The blue-jackets looked and marched well, and were highly complimented. This act of courtesy struck me as being well-placed, and a good promoter of friendly feeling between the two nations, who have so much in common; besides, it gave the captain an opportunity of showing the Chinese, that in addition to his naval guns, he was prepared to land a respectable force, and do some fighting on shore.



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